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McMARTIN (A.). **Fungicidal treatment of Sugarcane cuttings. A practical success.**—*S. Afr. Sug. J.*, xxx, 2, pp. 71, 73, 75, 3 figs., 1946.

A survey is given of the results achieved to date by the treatment of sugarcane cuttings in Natal with fungicides against pineapple disease [*Ceratostomella paradoxa*: *R.A.M.*, xxv, p. 279] and other organisms. The following facts, in addition to information already presented, may be of interest. Verdasan, formerly applied at the same rate as aretan (1 lb. per 20 gals. water), has since been found effectual at a much lower dosage, viz., 6 oz. per 20 gals. The other mercurials, ceresan, agrosan, and abavit, should be used at a dosage of 2 lb. to produce comparable results. An instantaneous dip of the ends of the canes, tied in bundles, in a few inches of the disinfectant is all that is required to ensure effective control, but some growers find it more economical in labour to immerse the bundles completely in tanks and then place them on draining racks.

The amount of aretan (the preparation most commonly employed) necessary per acre is very variable. The lowest figure of 1 oz. was obtained in experimental plots with stripped cane of medium diameter and single-stick planting. On the field scale, 2 oz. may suffice for thoroughly cleaned cane, but 4 oz. would be a more usual dosage for moderately clean material, while for cane with adhering trash ½ lb. per acre is an appropriate rate. Data collected from large-scale plantings give an average figure of 4 to 5 acres per lb. aretan for the Co. 281, 301, and 331 varieties, with trashed to semi-trashed cane planted with an overlap, and 2 acres for untrashed, double-stick planting. Under normal conditions the cost per acre for aretan should work out at 1*s.* 9*d.* to 3*s.* 6*d.*

PRÉVOT (A. R.). **Études de systématique bactérienne. VII. Actinomycetales.** [Studies on bacterial taxonomy. VII. Actinomycetales.]—*Ann. Inst. Pasteur*, lxxii, 1–2, pp. 2–11, 1946.

The interests of structural homogeneity of families and genera, as well as the need for a differentiation between Gram-negative and Gram-positive groups of bacteria, are deemed to require a reclassification of the Actinomycetales [*R.A.M.*, xxiii, p. 150], and the author accordingly proposes the following scheme: Class Actinomycetales; orders (1) non-acid-resistant, Actinobacteriales new order, comprising the families of Gram-negative Sperophoraceae Prévot and Gram-positive Actinomycetaceae Buchanan, and (2) acid resistant, Mycobacteriales new order, represented by a single family Mycobacteriaceae Chester 1901. Five genera are included in the Sperophoraceae, while the Actinomycetaceae comprise *Actinomyces*, *Proactinomyces*, *Corynebacterium*, *Actinobacterium*, *Bifidibacterium*, and *Erysipelothrix*. *Mycobacterium* Lehmann and Neumann 1896 is the only genus of the Mycobacteriaceae.

Langdon (R. F.) & Herbert (D. A.). **Records of Queensland fungi. IV.**—*Pap. Univ. Qd*, ii, 4, 4 pp., 1944. [Received May, 1946.]

In this further annotated list of 25 Queensland fungi [cf. *R.A.M.*, xvii, p. 70] mention may be made of *Diorchidium tricholaenae* on red Natal grass (*Rhynchelytrum repens*), almost certainly a South African introduction; *Uromyces orientalis* on *Indigofera linifolia*; and *Urocystis gladioli* on Picardy *Gladiolus* [ibid., xxi, p. 258]. The last-named is believed to be widespread in Australia, where (in all probability) the diseased corms were grown owing to war conditions.

Stapp (C.) & Marcus (O.). **Serologische Untersuchungen am Tabak über Ausbreitung und Verteilung der 3 Kartoffelviren X, Y und A.** [Serological investigations on Tobacco concerning the extension and distribution of the three Potato viruses X, Y, and A.]—*Zbl. Bakt.*, Abt. 2, cv, 20–22, pp. 369–405, 44 diags., 1943. [Received May, 1946.]

The presence of all three potato viruses, X, Y, and A, severally and together, could be detected in Samsun Bashi Bagli tobacco with the aid of the precipitin-drop (sero-micro-method). As sole occupant of the plant, the X virus spread more rapidly than either of the others. If X was already present in the host before the advent of Y, the extension and multiplication of the latter was still further markedly delayed, whereas A under comparable conditions made better headway. The combination of Y and A did not hinder the progress of either component to any appreciable degree. The simultaneous inoculation of plants with all three viruses led in some cases to pronounced delay in their diffusion.

Foliar symptoms and stunting of the plants were most conspicuous when X and Y or X and A entered simultaneously and A or Y was added later, i.e., when infection was initiated by the mild virus and carried on by a severe one.

Portions of the stem were often virus-free, an observation interpreted as confirmatory of Köhler's assumption of discontinuous migration [cf. *R.A.M.*, xvii, p. 561]. The early detection of infection in the roots seems to point to rapid transport through the phloem over considerable distances. No virus was found in the seeds of mature plants inoculated with X at an early stage of development. The maximum virus concentration within the host was attained by X and the minimum by Y.

Various hypotheses are advanced and briefly discussed in explanation of the discovery in apparently healthy leaves of one or more viruses, and their absence from foliage showing symptoms of varying intensity.

Steinberg (R. A.). **A 'frenching' response of Tobacco seedlings to isoleucine.**—*Science*, N.S., ciii, 2672, pp. 329–330, 1946.

Isoleucine at dosages of 50 to 20 p.p. mille in the culture medium used for the growth of tobacco seedlings at the Bureau of Plant Industry, Beltsville, Maryland, induced various abnormalities in the plants, including loss of dominance of the apical bud, production of numerous narrow leaves, and mottled chloroses. The shortened stem and profusion of axillary buds resulted in a 'witches' broom' growth habit. These features are characteristic of 'frenching' disease, which may also be simulated by plants suffering from sulphanilamide (*Amer. J. Bot.*, xxvi, p. 14, 1939) or thallium toxicity [*R.A.M.*, xviii, p. 716; xix, p. 499]. The extreme environmental conditions employed for the tests, i.e., very high moisture and relative humidity, low light intensity, and the substitution of agar for soil, resulted in slight deviations from the typical symptoms of frenching in the field. For instance, the foliar mottling did not assume the characteristic reticulate pattern and the narrow or strap leaves were not conspicuously erect, nor did they show much indication of marginal undulations or ruffling. None of the other amino acids, sugars, vitamins, or peptones tested (60 or so in all) caused comparable anomalies of growth.

TERRIER (C.). **La maladie des Ormeaux.** [The disease of young Elms.]—*Bull. Murith.*, lxii, pp. 71–84, 5 figs., 1944–45.

After stating that elm trees in parts of central Valais, Switzerland, are seriously affected by *Ophiostoma* [*Ceratostomella*] *ulmi* [*R.A.M.*, xxiv, p. 344], particularly at Savièse and at St-Pierre-de-Clages, and also along the right bank of the Rhône from Saillon to Loèche, the author gives a full account of the disease, including its symptoms, transmission, geographical distribution, economic importance, and control. Reference is also made to varietal resistance and secondary hosts, and there is a bibliography of 28 titles.

RÉGNIER (R.). **Le chancre suintant et les différents types de Peupliers.** [Running canker and the different types of Poplar.]—5 pp., Académie d'Agriculture de France, 1943. [Received February, 1946.]

In an endeavour to find poplar varieties resistant to bacterial canker [*R.A.M.*, xviii, p. 68; xxiv, p. 210] an experimental plantation of poplars was established in 1931 near Noyon, France. The following species were found to be resistant or immune: *Populus simonii*, $\times$ *P. eugenii*, $\times$ *P. berolinensis*, and $\times$ *P. gelrica*; those which were generally resistant were *P. nigra*, *P. monilifera*, *P. virginiana*, primary hybrids, e.g., $\times$ *P. serotina* and its varieties, and secondary female hybrids, e.g., $\times$ *P. marilandica* and its variety *laevigata*. The most susceptible were *P. candicans*, some of the offspring of $\times$ *P. generosa* (others were immune), secondary and tertiary hybrids of black poplars and female regenerated poplars ($\times$ *P. regenerata*) from infected areas. Many hybrids are still under trial.

P. candicans and $\times$ *P. regenerata* must therefore be completely eliminated from localities where the disease is intense. In areas where infection is absent or only slight $\times$ *P. regenerata* may be grown provided it is multiplied locally and subjected to careful control. Healthy *P. candicans* trees from unaffected localities may be planted in isolated, mountainous areas. Strenuous prophylactic measures are essential. The despatch of trees to unaffected areas should be closely watched, and that of susceptible and untested types should be forbidden. In the vicinity of the original areas of infection, and everywhere else in the department, the poplars, other than *P. candicans* and regenerated, are unaffected. Plantations should be cleaned up and diseased trees cut down for firewood.

GÄUMANN (E.). **Influence de l'altitude sur la durabilité du bois de Mélèze.** [The effect of altitude on the durability of Larch wood.]—*Bull. Murith.*, lxii, pp. 47–52, 5 graphs, 1944–45.

When the heartwood of larch (*Larix decidua*) from 75 trees aged from 75 to 360 years and grown at all altitudes from 460 to 2,100 m. above sea-level in the canton of Grisons, Switzerland, was experimentally exposed to infection by *Polyporus vaporarius* [*Poria vaporaria*] under conditions of constant temperature and humidity (the selected trunks being of commercial dimensions and their humidity the same as in forest conditions), it was found that the average loss in dry weight due to rotting in trees growing at an altitude of 1,050 to 1,750 m. was only two-thirds of that in those grown outside that range. Attention is drawn to the fact that these figures hold good only for the locality concerned.

BOUDRU (M.). **La maladie des pousses du Pin noir d'Autriche. Brunchorstia destruens Eriksson.** [The shoot disease of Austrian black Pine. *Brunchorstia destruens* Eriksson.]—*Bull. Soc. for. Belg.*, liii, 1–2, pp. 2–14, 9 figs., 1946.

In this account of the disease of *Pinus* spp. caused by *Brunchorstia destruens* [*R.A.M.*, xi, p. 757; xxiii, p. 200] the author states that the most susceptible variety is Austrian black pine (*P. nigra* var. *austriaca*). He has observed the disease

on a five-year-old *P. resinosa*, and it has also been reported in Belgium on one-year-old seedlings and transplants of Austrian black pine. Infection becomes less severe on trees over 40 years old. Instances of the association of other parasitic diseases with *Brunchorstia* suggest that the latter may behave as a weak or secondary parasite. Under Belgian conditions the only control necessary is the repeated removal of dead and severely affected trees. Infected materia l should be burnt.

FRITZ (CLARA W.). **Does depth influence rate of decay in mine timber?**—*Canad. Min. J.*, lxiii, 11, pp. 719–720, 1942.

Merulius lacrymans was found to be the principal agent of decay in timbers at the upper levels of the mine of the Kirkland Lake Gold Mining Company, Ltd., Ontario. The fungus is excluded from the 5,400 ft. level by the prevailing high temperatures (76° to 80° F.), while other fungi were prevented from developing on these timbers by the dryness of the wood. It is concluded that depth influences timber decay only by the provision of environmental conditions favourable or otherwise to the fungi introduced into the mine.

Report on a visit to Dr. Wolman, Wood Preservation Specialist, Bad Kessingen.—Final Report No. 216, British Intelligence Objectives Sub-Committee, pp. 5–6, London, H.M. Stationery Office, [? 1945. Mimeographed.]

Dr. Wolman, in an interview on 31st October, 1945, described the pre-war wood-preservation situation in Germany as follows. Creosote and Wolman salts [triolith: *R.A.M.*, xxii, pp. 189, 464; xxv, p. 242] were the chief preservatives, 75 per cent. of ties having been treated with the former and 25 per cent. with the latter. The absorption of creosote is about 63 kg. per cu.m. by the Rueping process, and that of 2 per cent. Wolman salts 200 kg. Beech was used for 25 to 35 per cent. of the material and pine for the remainder. Oak was often used for cross-track ties. About half the spruce or pine poles were treated with either of the two preservatives. Only pressure treatments were used for creosote, while triolith was applied by the Boucherie or open-tank processes. Some 95 per cent. of mining timbers were treated with triolith.

During the war the only preservative available in the country was zinc chloride, the use of which had been discontinued 40 years previously owing to its corrosive action on iron. Full-cell pressure treatments were given, involving an absorption of 16 kg. of the dry salt per cu.m.

Dr. Wolman thought it improbable that creosote would be extensively used for wood preservation in the future in Germany, since its price is RM. 0·05 per kg. and the substitute for diesel oil obtained from it sells at RM. 0·18. Its place will presumably be taken by triolith.

Old ties have been salvaged by Dr. Bäseler, of the State Railways Administration, by removing the rotted portions and glueing together the sound pieces with tego-film, kaurit, or other synthetic water-proof adhesives. The glue is set by the heat generated by the passage of an electric current through wires embedded in the joint.

NAGEL (C. M.). **Epiphytology and control of Sugar Beet leaf spot caused by Cercospora beticola Sacc.**—*Res. Bull. Ia agric. Exp. Sta.* 338, pp. 680–705, 1 fig., 1 diag., 8 graphs, 1945.

The experiments on which this report is based relate to the years 1933 to 1937, inclusive, and are concerned with the effect under Iowa conditions of different spacing widths on beet leaf spot (*Cercospora beticola*) development, acre yield, and sucrose content [*R.A.M.*, xvii, p. 719]. In 1933, 1934, and 1937, under conditions of moderate infection, the disease was less injurious to the foliage in the wider spacing

(21 × 21, 24 × 24, and 28 × 28 in.) than in the narrower (12 × 12, 12 × 21, 14 × 14, 18 × 18, 12 × 24 in.) In the wet season of 1935, which was marked by a severe epidemic of leaf spot, the plants in all the spacings sustained heavy damage. On the other hand, in 1936 the dry weather almost entirely prevented the development of infection, and the differences in plot yields were attributed partly to this factor and partly to the various spacings. With the possible exception of the 21 × 21 in. spacing in 1937, the yields did not differ significantly in the spacings commonly used in practice, viz., 12 × 21, 18 × 18, and 21 × 21 in. The virulence of the pathogen tended to be enhanced with an increase in the number of plants per hill from one to four. In each year wider spacings produced larger beets than the closer ones, though the acre yield of the former was usually lower. The steady increase in size of the beets with an increase in spacing remained fairly steady regardless of the season or intensity of leaf spot, and in one season was sufficient to give a yield equal to or more than that of smaller beets at closer spacings. The use of doubles at wide spacings appears to be a practical method of cultural control, since there is some reduction in leaf spot and the doubles may, under commercial conditions give a greater yield, since the complete loss of hills so frequent in machine culture would undoubtedly be less when doubles are left rather than singles. The differences in sucrose percentage in the several spacings and number of plants per hill were negligible.

Huckett (H. C.). **Timing rotenone applications for control of the Pea aphid on Long Island, with special reference to mosaic incidence.**—*Bull. N.Y. St. agric. Exp. Sta.* 713, 29 pp., 8 figs., 1945.

The difficulties of pea-growers on Long Island appear to be conditioned largely by climatic conditions in relation to the wind-borne dissemination of the pea aphid, *Macrosiphum pisi*, and the incidence of the pea mosaic virus [*R.A.M.*, xvi, p. 83] with which it is associated.

A single application of rotenone when plants were beginning to flower increased the average yield by 26·9 per cent. over the controls, and the number of plants apparently infected was reduced from an average of 17·7 per cent. in untreated plots during 1941, 1943, and 1944 to 9·3 per cent. In comparison two to five applications were followed by an increased yield of 25·8 to 32·4 per cent. over untreated plots and the number of apparently infected plants fell to from 6·9 to 11 per cent. The adverse effect of high temperatures and strong winds is reflected in the relatively small increase in control given by several applications over that given by one or two.

Price (W. C.). **Purification and crystallization of southern Bean mosaic virus.**—*Amer. J. Bot.*, xxxiii, 1, pp. 45–54, 5 figs., 1946.

This is an expanded account of the writer's work in connexion with the purification and crystallization of the southern bean mosaic virus, a preliminary note on which has already appeared [*R.A.M.*, xxiv, p. 397]. The purified material appeared homogeneous when examined in an analytical centrifuge, electrophoresis and diffusion apparatus, and an electron microscope. Such preparations reacted positively to tests for protein and negatively to those for carbohydrate, and contained spherical particles with a mean diameter of 33·6 $m\mu$. They maintained their activity for months at 3° C. but rapidly lost it when frozen (−10°): in one test 95 per cent. of the infectivity of a purified sample disappeared in six days, 98·4 per cent. in 11, and complete inactivation was effected in three months. Solutions of the crystallized material, consisting either of rhombic bipyramids joined by two pinacoids or rhombic prisms, were highly active and induced typical southern bean mosaic symptoms on Early Golden Cluster and Scotia beans (*Phaseolus vulgaris*), Lima beans (*P. lunatus*), and soy-beans.

Price (W. C.). **Accuracy of the local-lesion method for measuring virus activity. IV. Southern Bean mosaic virus.**—*Amer. J. Bot.*, xxxii, 10, pp. 613–619, 1 fig., 1 graph., 1945.

Continuing his experiments in the measurement of the activity of virus diseases [*R.A.M.*, xxiii, p. 152], the author presents the results when similar procedures were adopted in calculating the activity of southern bean mosaic virus [see preceding abstract].

A preliminary experiment in which leaves of Early Cluster bean (*Phaseolus vulgaris*) plants were inoculated with a range of dilutions of the virus (the stock being obtained by three different methods) established that a dilution curve must be obtained for each experiment from the data, two or more dilutions being used to determine its slope. An assumption of unit slope introduces error. Local lesions caused in 18 Early Golden Cluster bean plants by two dilutions of purified virus preparation specified as standard were compared with those caused by two other dilutions designated as of unknown strength. Each plant had two leaves; one half of one leaf was rubbed with the first standard dilution and the other half with the corresponding unknown; the second leaf was used for the second pair of dilutions. The lesions were counted after five days. It was shown that the activity of the virus could be measured with an error seldom exceeding 10 or 15 per cent. when the proper concentration of the unknown and the standard were used. Moreover, where dilutions are chosen so that the unknown is about 25 per cent. of the standard in one case, and 50 per cent. in the other, it is 0·95 probable that the estimate will not differ from the true value by more than 40 per cent. on the one hand and 20 per cent. on the other. The accuracy was greater when the two concentrations tested differed by only 50 per cent. instead of 75 per cent., while the standard error of the estimate, which may be computed from the data, indicated the error of measurement fairly accurately.

Boswell (V. R.). **Disease resistant and hardy varieties of vegetables.**—*Nat. hort. Mag.*, xxv, 2, pp. 158–164, 1946.

In this fifth and final instalment of his survey of the present position of vegetable-breeding for disease resistance and hardiness in the United States [*R.A.M.*, xxv, p. 151], the author discusses recent developments in the selection of lettuce for resistance to downy mildew [*Bremia lactucae*]; peas capable of withstanding wilt (*Fusarium* [*orthoceras* var. *pisi*]) and other fungi and viruses; root crops (beet, carrot, parsnip, radish, turnip, and swede), which do not, in general, vary greatly in their reactions to pathogenic agencies, except in the case of beet curly top virus; and spinach for resistance to 'blight' or mosaic [cucumber mosaic virus].

Chowdhury (S.). **A Rhizoctonia leaf blight of Dioscorea.**—*Curr. Sci.*, xv, 3, pp. 81–82, 1 fig., 1946.

A species of yam, *Dioscorea alata*, cultivated in Sylhet, Assam, for its edible tubers, was severely attacked in July, 1944, by *Rhizoctonia* [*Corticium*] *solani*, which caused a leaf blight characterized by the radiation from an infection centre of alternating light and dark brown, concentric zones. Following the collapse of the initially infected basal leaves, the pathogen spread down the petiole to the stem, involving the rest of the foliage in its progress. Scattered strands of coarse mycelium were often observed traversing the surfaces of badly blighted leaves, and microscopic examination further revealed the presence of small stromatic areas or 'infection cushions', which were described by Duggar [for *Helicobasidium purpureum*] (*Ann. Mo. bot. Gdn*, ii, pp. 403–458, 1915) as of material assistance in the process of penetration and apparently serving as a fulcrum for the intrusion of the hyphae through the uninjured epidermal cells. The 'cushions' were formed on both surfaces of all inoculated leaves, irrespective of the position of the stomata,

and marked symptoms of infection developed within four or five days. This is the first record of *C. solani* on the host under observation.

Ciferri (R.). **Le malattie della Manioca ('Manihot esculenta' Crantz) in San Domingo. III. Identità e nomenclatura delle 'Cercospora' viventi sulle 'Manihot'.** [The diseases of Cassava (*Manihot esculenta* Crantz) in San Domingo. III. Identity and nomenclature of the *Cercospora* species living on *Manihot* plants.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, pp. 99–114, 5 pl., 2 figs., 1940. [Received February, 1946.]

Continuing his study on cassava (*Manihot esculenta* = *M. utilissima*) diseases in the Dominican Republic [*R.A.M.*, xiii, p. 147], the author states that he found two distinct species of *Cercospora* on this host there, one causing small, dry, whitish spots, usually present in large numbers on every segment of the leaf and found all through the year wherever cassava was grown, and the other producing large, damp, diffuse, greyish or brownish spots, of which only one was present, as a rule, on each leaf segment; these spots were observed only in the wet season. From a detailed study of the subject, including an exhaustive review of the literature, he concludes that the organism causing the first disease is *C. henningsii* Allescher in P. Henn., Die Pflanzenwelt Ostafrikas, Teil C, p. 35, 1895, with which the following are considered to be synonymous: *C. cassavae* Ell. Ev.; *C. manihotis* P. Henn., 1902; *C. manihotis* P. Henn., 1907; *C. cearae* Petch; *C. manihoticola* Stev., 1923, ined. [nom. nud.]; *Septogloeum manihotis* Zimm.; *Cercosporella pseudoidium* Speg. non. Cif. The fungus causing the second disease is *Cercospora caribaea* Chupp & Cif., Mycofl. Domingens. Exs. 12 1931 [nom. nud.]; Chupp in Müller & Chupp, 1935 [*R.A.M.*, xv, p. 59], with which the following are regarded as synonymous: *C. henningsii* auct. plurib. (incl. Cif. *Ann. mycol., Berl.*, xxix, p. 290, 1931) non Allescher; *C. cearae* Chupp in Chardon & Toro, 1930, non Petch; *Ragnhildiana manihotis* Stev. & Solh.; and *Corynespora manihotis* Solh., ined. (*in litt.*, 1932).

Levadoux (M. L.). **Le Brenner (Pseudopeziza tracheiphila Müll.—Thurg.).** [Brenner (*Pseudopeziza tracheiphila* Müll.-Thurg.).]—12 pp., 2 figs., Imprimerie du Bulletin de l'Office International du Vin, Alençon (Orne), 1944. [Received February, 1946.]

The author gives a clear, succinct account in semi-popular terms of the history, symptoms, effects, progress, and control of vine 'brenner' (*Pseudopeziza tracheiphila*) [*R.A.M.*, viii, p. 701; xx, p. 515; xxiii, p. 208], based largely on the literature of the subject. The disease is of long standing in the east-central and north-eastern regions of France, where, however, since the introduction of cupric spraying [against *Plasmopara viticola*] it seldom causes serious loss. It occurred in 1944 [? in the vicinity of Montpellier].

Stanley (W. M.), Knight (C. A.), & De Merre (L. J.). **Actualités médico-chirurgicales. VI. Les virus. Études biochimiques et biophysiques récentes.** [Medico-surgical topics of to-day. VI. Viruses. Recent biochemical and biophysical studies.]—81 pp., 4 figs., Bruxelles, Fondation Francqui, & New York, Belgian-American Educational Foundation, Inc., 1945.

This brochure is one of a series prepared for the use of the medical profession in Belgium edited and prefaced by Dr. E. J. Bigwood. A clear and succinct review is presented of the work done, particularly by British and American investigators, during the past five or six years on virus diseases. The ground covered comprises the physico-chemical properties of viruses (composition and structure, dimensions and forms, bi-refringence, effects of various chemical and physical agents, extraction and purification) and their biological properties (synthesis and multiplication,

transmission, virus complexes, serological studies, inclusions, and quantitative determination methods). The bibliography extends to 336 items. The clinical aspects of the subject are reserved for a later publication.

Compte rendu sommaire des travaux des stations et laboratoires de pathologie végétale en 1940. [Brief report on the work of the plant pathological laboratories and stations in 1940.]—*Ann. Épiphyt.*, N.S., vii, 2, pp. 135–142, 1941. [Received April, 1946.]

During 1940 vine mildew (*Plasmopara viticola*) [*R.A.M.*, xxiv, p. 490; xxv, pp. 59, 94, *et passim*] was very severe in south-western France. The vines at the Agronomic Centre were sprayed on 7th and 22nd May, 4th and 17th June, and 1st and 16th July, and on 21st July were given a dust application against brown rot. The first treatment was not very effective, the second gave good results, the third was of secondary importance as regards foliage protection, but kept the bunches free from grey rot [*Botrytis cinerea*], and the fourth was of prime importance, every vine which failed to receive it subsequently having its entire crop affected; the same applied to the fifth, and the sixth was also indispensable, vines not receiving this application later having nearly all their leaves affected; the final dusting arrested brown rot.

In many parts of the Bordeaux area *Oidium* (*Uncinula necator*) [ibid., xxiv, pp. 50, 490] caused heavier losses than *P. viticola*. The disease seems to grow worse every year, locally.

At Bordeaux peach scab, apparently caused by a fungus closely resembling *Fusicladium amygdali*, was observed for the first time.

Further work was carried out at Clermont on forecasting outbreaks of potato late blight (*Phytophthora infestans*) [ibid., xvi, p. 514; xviii, p. 814], diseased tubers being planted among healthy ones at different observation posts, and three susceptible varieties maturing at different dates (Bintje, Early Rose, and Saucisse) being used. At Clermont-Ferrand rain between 9th and 15th July induced primary infection; the atmospheric humidity remaining at 100 [per cent.] for 28 hours and the average temperature at 14°[C.]. At Antibes the disease developed with great intensity on late tomatoes and potatoes. The passage of the disease from potatoes to tomatoes under glass in the vicinity was observed.

Compte rendu sommaire des travaux des stations d'avertissements agricoles. [Brief report on the work of the agricultural forecasting stations.]—*Ann. Épiphyt.*, N.S., vii, 2, pp. 147–152, 1941. [Received April, 1946.]

Most of the items of information contained in this report have already been noticed [see preceding abstract].

Rapport sommaire sur les travaux poursuivis en 1940 par les stations d'amélioration des plantes. [Brief report on the work carried out in 1940 by the plant improvement stations.]—*Ann. Épiphyt.*, N.S., vii, Numéro spécial, pp. 143–156, 1941. [Received April, 1946.]

During 1940 wheat varieties growing at the Clermont-Ferrand Plant Improvement Station were subjected to a severe outbreak of *Puccinia graminis*, but Picardie, Préparateur Étienne, and Blé des Dômes showed only slight infection. The last-named, previously known as C.F.I., derives from K8 × Szekacs. It is very resistant to cold, early, of excellent grain quality and shows good resistance to *P. graminis* and yellow rust [*P. glumarum*].

Comparative tests carried out since 1935 showed that Probstdorf winter barley was outyielded only by Hâtif de Grignon, which, however, is more susceptible to lodging and very susceptible to smut (*Ustilago nuda*), while the quality of its grain is much inferior.

Flax at Versailles was severely attacked by anthracnose (*Colletotrichum lini*) but the varieties Gilliland, Szekacs, and Tataras showed relatively little damage.

Lepik (E.). **Pflanzenpathologie im Ostland. II. Mitteilung. Ein Beitrag zur Kenntnis wenig bekannter Pflanzenkrankheiten aus Estland.** [Plant pathology in the Ostland. Note II. A contribution to the knowledge of little known plant diseases from Estonia.]—*Zbl. Bakt.*, Abt. 2, cvi, 5–7, pp. 89–93, 4 figs., 1943. [Received May, 1946.]

This second note on phytopathology in the 'Ostland' [cf. *R.A.M.*, xxii, p. 263; xxv, p. 63] is a disease survey of Estonia for 1942, and includes the following items.

Lilac (*Syringa vulgaris*) showed fairly heavy infection by *Phyllactinia suffulta*.

Plantings of *Taraxacum kok-saghyz* introduced at the time of the Russian occupation suffered intensive injury from *Botrytis cinera*, causing premature collapse and complete decay of the inflorescences.

Cercospora concors, seldom observed in Germany, is widespread in Estonia, where it is responsible for substantial damage to the potato crop; in 1942 up to 100 per cent. of the leaves were infected in a number of localities. *C. dubia* [ibid., xiv, p. 195], an uncommon parasite of *Atriplex hortensis*, produced large spots and shrivelled zones on the foliage.

Three unusual species of *Colletotrichum* were also in evidence during the period under review, viz., *C. pisi* on peas, *C. solanicolum* [*C. atramentarium*] on potato, and *C. spinaciae* on spinach [ibid., xix, p. 189]. Among the late potato varieties attacked by *C. atramentarium* were Deodora, Jubel, Jögevaer Stärkereiche Blaue, Lorch, and Majestic. Contrary to statements in the relevant literature, the fungus was found not only on the underground stems but also on the aerial organs. *C. spinaciae* destroyed up to 80 per cent. of the spinach crops in the vicinity of Dorpat, interfering considerably with seed production.

Phoma solanicola, only once reported from Germany [ibid., vii, p. 667], was fairly prevalent in Estonia in 1942, especially on late potato varieties, almost invariably in association with *C. atramentarium*. The former produces large, blackish-brown lesions on the stems and petioles, which rapidly wither.

Septoria ribis [*Mycosphaerella grossulariae*: ibid., xii, p. 640; xxiii, p. 43] occurred in a virulent form on black currants, the small, sunken areas developing into cracks and involving the total collapse of the fruits.

White (N. H.). **Plant disease survey of Tasmania for the three year period 1943, 1944, 1945.**—30 pp., 1 map, Tasmanian Department of Agriculture. [? 1946. Mimeographed.]

This first comprehensive survey of plant diseases in Tasmania includes the following new records for the State. Heavy losses were caused in the black currant crop during 1943 by *Septoria ribis* (*Mycosphaerella ribis*) [*M. grossulariae*: see preceding abstract], which is present in every currant garden in Southern Tasmania. Previously the currant crops received no fungicidal spray, but it has now become necessary to give three Bordeaux applications. Burial or burning of fallen leaves will eliminate the *Mycosphaerella* stage. Black currants are more severely affected than red. Two cases of strawberry leathery rot (*Phytophthora cactorum*) [*R.A.M.*, xix, p. 26] occurred at Launceston. Northumberland and Fill-basket raspberries were susceptible to *Phragmidium rubi-idaei*.

Ring spot (*M. brassicicola*) [ibid., xxii, p. 335] occurred each year in autumn on cauliflowers and cabbages at Summerleas, Hobart, and Launceston, causing heavy damage to one cauliflower crop. Cauliflowers, cabbages, broccoli, and Brussels sprouts in all parts of Tasmania were attacked each year in November, December, and January by light leaf spot (*Gloeosporium concentricum*) [ibid., xix, p. 449].

Ring spot (*Marssonina panattoniana*) [ibid., xxiii, p. 474] in September, 1945, attacked crops of outdoor winter lettuces, one at Launceston and another at Hobart, during rainy weather. Two cases of crinkle mosaic of onions (*Allium* virus 1) [onion yellow dwarf: ibid., xix, p. 511; xxiv, p. 486] occurred, at Glenorchy and Moonah. In March, 1944, parsnips at Scottsdale, Margate, and Hayes were attacked by leaf spot (*Ramularia pastinacae*) [ibid., xviii, p. 413; xxiv, p. 5]. Chantenay carrots were very susceptible to mosaic, while Osborn pink and a Manchester selection were highly tolerant. Vetomold tomato was susceptible to *Cladosporium fulvum* [cf. ibid., xxiii, p. 474 *et passim*]. Goldthorpe barley showed 5 per cent. infection of ergot [*Claviceps purpurea*].

Potatoes were attacked from January to April each year by pink rot (*Phytophthora erythroseptica*) [ibid., xx, p. 32; xxiv, p. 491]; the disease appears to have been present for a long time, though not previously recognized. One potato tuber showed charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: ibid., xxiii, p. 455].

Antirrhinum scorch or shot hole (*Heteropatella antirrhini*) [ibid., xvii, p. 824] was very severe on second-year plants in gardens and among seed crops in August and September of each year in and round Hobart. Large numbers of plants were killed. *Delphinium* plants (seed crops) at Hayes and Margate showed bacterial tarry blotch (*Pseudomonas delphinii*) [ibid., xiii, p. 356]. Storage rot of *Gladiolus* corms (*Botrytis gladioli*) [ibid., xx, p. 364] was effectively controlled by de-scaling ten days after digging and then treating with tetroc or spergon. *Gladiolus* mosaic (*Cucumis* virus 1) [cucumber mosaic virus: ibid., xxiii, p. 488] caused blotching of flowers especially in Picardy, and running-out of corms. Leaf scorch of daffodils [*Narcissus pseudo-narcissus*] and jonquils [*Narcissus jonquilla*] due to *Stagonospora curtisii* [ibid., xxiii, p. 79] occurred in some gardens in November.

In his concluding paragraphs the author briefly refers to the unusual weather conditions experienced during the period under review and also points out that although only 4 per cent. of the diseases recorded were due to viruses, more than half the economic losses sustained were caused by virus attacks. Bacterial diseases also caused serious economic loss.

Divisions of Plant Pathology and Seed Investigations.—*Rep. N.Y. St. agric. Exp. Sta., 1944–5*, pp. 40–52, 59–63, 1945.

In this report [cf. *R.A.M.*, xxiii, p. 327; xxiv, p. 265] R. F. Suit states that blueberry [*Vaccinium* spp.] stunt [ibid., xxi, p. 496] was transmitted by grafting and also by aphids (? *Amphorophora vaccinii*) in one of 12 tests.

During 1944 vine black rot [*Guignardia bidwellii*] caused a total loss in some vineyards and required five treatments with Bordeaux mixture for its control elsewhere. For vine powdery mildew [*Uncinula necator*] alone two applications of Bordeaux mixture (2–4–100) plus 1 lb. rosin fish-oil soap sufficed. The pre-bloom spray was applied at the rate of 150 gals. per acre, and the later ones at 200 to 250 gals. The addition of a spreader-sticker improved disease control on the bunches. In limited trials three applications of fermate (2–100) gave better control of black rot than any other fungicide tested. In four seasons' observations of varietal resistance to black rot, downy mildew [*Plasmopara viticola*], and powdery mildew, Clinton only of 11 varieties was uninfected. Catawba and Niagara showed most infection, being attacked by all three diseases, as were Fredonia and Golden Muscat. Black rot was not observed on Delaware, Elvira, Ives, or Missouri Riesling, while Concord showed no downy mildew.

J. M. Hamilton and D. H. Palmiter report that, as usual, the sulphur pastes gave better protection against apple scab [*Venturia inaequalis*] than dry treatments. Fermate gave satisfactory control and puratized N5 X and isothan Q15 [cf. ibid., xxiv, pp. 138, 139] were promising.

In studies on peach leaf curl [*Taphrina deformans*: ibid., xxiii, p. 349; xxiv, p. 493], J. M. HAMILTON found that elgetol (1 qt. per 100 gals.) and other DN [*dinitro*] compounds at an equivalent concentration gave better control than Bordeaux mixture and lime-sulphur, when applied after the buds had cracked. In another block fermate with zinc sulphate-lime and copper oxychloride sulphate with orthex [ibid., xxiii, pp. 33, 70, 444] gave good results.

J. M. HAMILTON and G. L. MACK report the conversion of a commercial duster into a 'spray duster' for cherries and peaches by attaching a fish-tail device for applying the dust to the under side of the leaves, retention being assured by the atomization of a liquid into the dust stream. An aqueous 0·1 per cent. solution of polyvinyl alcohol doubled the dust deposit, with only about one-tenth the amount of liquid required for spraying.

In tests by W. T. SCHROEDER of fungicides as seed protectants spergon (2 oz. per bush.) gave the best results on canning peas and effectively eliminated friction in the drill. Arasan (2 oz. per bush.) came next, but caused friction in the drill. On sweet maize seed arasan (1·5 or 2 oz. per bush.) was as good as, or better than, any other material tested in the field. Treatments of Lima bean [*Phaseolus lunatus*] seed at different planting dates indicated that spergon and arasan at 2 oz. per bush. are the best materials to use where seed decay may occur. With spinach seed, arasan (1 per cent.), zinc oxide (2 per cent.), yellow cuprocide (0·5 per cent.), and red cuprocide (1·5 per cent.) gave the best results.

W. T. SCHROEDER, O. A. REINKING, and C. B. SAYRE found that on soils infected by pea root-rot [*Aphanomyces euteiches*, *Fusarium solani* var. *martii* f. 2, *Pythium ultimum*, *Corticium solani*, and *Ascochyta pinodella*: ibid., xxii, p. 285], nitrogenous fertilizers to some extent controlled the severity of disease development.

In tests by W. T. SCHROEDER Tennessee tribasic, microgel, and COCS (44 per cent.), as well as Bordeaux mixture (4–2–50), gave better control of tomato blight (*Alternaria solani*) [ibid., xxiv, p. 294] than did dithane, fermate, or U.S.R. No. 604, but the two latter were equally more effective against anthracnose fruit rot [*Colletotrichum phomoides*: ibid., xxiv, pp. 168, 294]. Alternate applications of fermate and a copper fungicide, beginning with fermate, up to four or five sprays, gave almost as good control of early blight and as effective anthracnose control as the 'straight' copper or fermate schedules and if followed should give good yields and high quality fruit.

R. O. MAGIE states that, in further tests of the fungicidal treatment of hop twine and poles to control downy mildew [*Pseudoperonospora humuli*] on the young bines, the chemicals leaching out of the treated materials during rain protect the bines for four to six weeks during the period of rapid growth when spraying is impracticable. Twine treatment with a variety of fungicides plus a wetter (0·2 per cent. triton x-100 in water) showed copper compound A, yellow cuprocide, Tennessee tribasic, Bordeaux mixture, dithane, and thiosan giving good control without injury to the bine. Poles should be sprayed with some copper material of a concentration of 0·6 per cent. Other work showed that early-season applications of Bordeaux mixture (4–2–100) may damage young hop bines. Zinc sulphate-lime (6–3–100) applied in May and June controlled downy mildew without proving injurious. Frequent, thorough spraying with Bordeaux mixture did not prevent a late outbreak of powdery mildew [*Sphaerotheca humuli*]. It appears to be desirable to include a wettable sulphur (4 lb. per 100 gals.) in the July applications.

H. S. CUNNINGHAM and O. A. REINKING found that *Fusarium* seed-piece decay of potatoes (*F. caeruleum*, *F. sambucinum* f. 6, and *F. solani* var. *striatum*) [ibid., xxv, p. 139] occurs in seed stock not only in diseased tubers, but also on the surface of healthy ones. Of seed containing 10 per cent. infected tubers half was treated with yellow mercuric oxide (1–30) and dried, half was left untreated. All the tubers were then cut and bagged. Ten days later the treated tubers and the

untreated showed, respectively, 10 and 90 per cent. infection. When healthy, untreated tubers were cut, and part mixed with diseased seed pieces, the contaminated and uncontaminated seed pieces gave, respectively, 13 and 100 per cent. stand in shallow planting and 6 and 100 per cent. stand in deep. Shallow planting cannot be recommended as a control measure.

W. F. Crosier reports that New York State-grown hybrid maize was infected with *Diplodia zeae* in 5 per cent. of the stocks but not over 2 per cent. of the kernels in any stock. Stocks from other States were also infected. Sweet corn seed from other States for sale in New York State is commonly infected with *D. zeae*, occasionally with *Gibberella saubinetii* [*G. zeae*], and *F. moniliforme* [*G. fujikuroi*], and, rarely, with *Nigrospora sphaerica* [cf. ibid., xxiii, p. 383]. All these organisms remain viable for three to five years. Stowell's Evergreen seed stored for three years gave essentially the same percentage infection as originally. *A. radicina* [ibid., xxii, p. 340], isolated from diseased carrot and celery seed, was highly pathogenic. This is the first record of the fungus on commercial seed stocks at the Station. The control of stinking smut [bunt: *Tilletia caries* and *T. foetida*] in a badly infected stock of wheat given by new improved ceresan and copper carbonate was equalled only by 1452 C. In this experiment a planting rate of 2 bush. per acre was appreciably more profitable than one of 1 or 1·5 bush. The same dusts gave small but consistent increases in yield when used on disease-free wheat. Arasan controlled *D. zeae* and other fungi on maize seed; alone or diluted with flour it had no effect on germination, but it increased the green weight of the seedlings in a six-day test period.

Botany.—*Rep. Ga Exp. Sta., 1944–45*, pp. 48–58, [1945].

This report on plant disease work in Georgia [cf. *R.A.M.*, xxiv, p. 269] contains, *inter alia*, the following items of phytopathological interest. Spraying experiments gave no data upon which recommendations for spraying muscadine grapes [*Vitis rotundifolia*] against black rot (*Guignardia bidwellii*) [loc. cit. and preceding abstract] could be based. Surveys showed wide differences in susceptibility, Dulcet being the most resistant variety. The only form of leaf-spotting important on muscadine vines was angular leaf spot [*Mycosphaerella angulata*: ibid., xxi, p. 239]. The chief berry disease of muscadines was bitter rot (*Melanconium fuligineum*) [ibid., xxii, p. 126], which also caused speck on the vegetative parts.

Observations on snap bean [*Phaseolus vulgaris*] fields near Quitman in May, 1945, showed that root rot, which was causing about 20 per cent. reduction in stands, was due primarily to *Rhizoctonia* [*Corticium*] *solani*. A *Fusarium* sp. was isolated from many of the diseased plants. Inoculation experiments with *Macrophomina phaseoli* showed that infection from the soil causing charcoal rot occurs almost entirely through the cotyledons during emergence. Seed treatment may prove to be effective. The ashy stem-blight phase generally results from late leaf and stem infection of older plants by pycnospores, and does not affect the harvest of green beans, though it generally prohibits the growing of dry beans and seed. *Diaporthe sojae* [loc. cit.], which was commonly present on snap beans, cowpeas, soy-beans, and Lima beans [*P. lunatus*], is distinct from *D. phaseolorum* [cf. ibid., xv, p. 277; xxiii, p. 424]. Inoculation studies indicated that *D. sojae* is a saprophyte or, possibly, a weak parasite.

Treatment of machine-shelled Spanish groundnut seed with 2 per cent. ceresan, arasan, and spergon again gave significant increases in stand, ceresan giving the best results, followed in order by the other two. The results of two tests demonstrated that groundnuts may be safely hand- or machine-shelled four months before planting, if they are treated with an effective dust (e.g., 2 per cent. ceresan, spergon, dow No. 5 and No. 6 B at 3 oz. to 100 lb. seed or arasan at 2 oz.) at the time of shelling or any convenient date before planting.

In spraying and dusting tests against groundnut leaf spot [*Cercospora arachidicola* and *C. personata*] Spanish groundnuts were given three applications of fungicide. The average increases in yield per acre were, for eight tests with sulphur dust, 198 lb., for eight with copper-sulphur (10–90), 319 lb., and for two with Bordeaux (6–2-100), 241 lb. In a different test the maximum yield was obtained by digging 109 days after planting on undusted plots, and 116 days after planting on dusted plots, the yield of the latter showing an increase of 438 lb. per acre over the undusted.

Watermelon strain S 306, now designated Georgia No. 2, showed high resistance to wilt [*Fusarium bulbigenum* var. *tracheiphilum*: ibid., xxiii, p. 7], and has been sent to farmers for trial. Seed of the Georgia Wilt Resistant variety [loc. cit] is distributed annually. Several varieties of inedible cantaloupe resistant to downy and powdery mildews [*Pseudoperonospora cubensis* and *Erysiphe cichoracearum*: loc. cit.] were crossed with the Hearts of Gold, Hales Best, and Pride of Wisconsin and other varieties. About a dozen strains with high resistance to both mildews and with good eating qualities were isolated. It appears that resistance to downy mildew may be recessive.

Investigations showed that vetch anthracnose [? false anthracnose, *Protocoronospora nigricans*: ibid., xxii, p. 127] causes heavy losses to some species, smooth and hairy (*Vicia villosa*), purple (*V. atropurpurea*), and woolypod (*V. dasycarpa*) being the most susceptible. Damage is heaviest after prolonged wet periods in spring. Several strains of *V. sativa*, as well as *V. grandiflora*, are considerably more resistant.

On p. 14 it is stated that preliminary data confirmed previous results in indicating that some strains of the Empire cotton variety may be highly resistant to wilt [*F. vasinfectum*: ibid., xxi, p. 197]. For two years, CSS 3720 has shown up favourably in comparison with established varieties.

Annual Report of the Massachusetts Agricultural Experiment Station for the fiscal year ending 30th June, 1945 (Bulletin 428).—71 pp., 1 fig., 1 graph, 1945.

This report [cf. *R.A.M.*, xxiv, p. 404] contains, *inter alia*, the following items of interest. C. V. Kightlinger reports that new strains of Havana Seed tobacco for use in the Connecticut Valley are being produced, some of which give heavy yields of good-quality tobacco even in soils heavily infected with black root rot [*Thielaviopsis basicola*: ibid., xxiv, pp. 341, 403], and some are superior to Havana Seed 112 in type, quality, and growth habits.

W. G. Colby states that the new oat varieties Vicland, Tama, and Clinton have given good grain yields and shown high resistance to leaf rust [*Puccinia coronata*].

Investigations by W. L. Doran on the effects of various soil treatments on cabbage club root (*Plasmodiophora brassicae*) [ibid., xxiv, pp. 260, 483] demonstrated that infection was moderately well controlled without injury to the plants by mercurous chloride applied at the rate of 0·2 or 0·15 gm. per sq. ft. Sodium chloride applied alone did not give control, but at 10 gm. per sq. ft. appeared to favour plant growth. Mercurous chloride with sodium chloride gave better control than without it.

Further experiments on the relation between soil moisture content and damping-off again showed that by delaying the initial watering of seed pans for four to six days the stands of six common vegetables and three annual flowers were much improved.

Soil in which onions had shown poor growth and had been infected by pink root rot [*Phoma terrestris* and (?) *Fusarium vasinfectum* var. *zonatum* f. 1] was variously treated before planting onion sets or sowing onion seeds. The number of seedlings surviving, as compared with those in untreated soil, was increased 80 per cent. by sodium nitrate, and almost as much by fermate, though fermate did not prevent pink root rot. Severe pink root rot on onions from sets in untreated soil (a *Fusarium*

sp. being isolated from the affected roots) was partly controlled and early growth conspicuously improved by copper sulphate 200 lb. or sodium nitrate 400 lb. per acre.

E. F. Guba found that certain primitive tomatoes received from the Division of Plant Exploration and Introduction were resistant to every local strain of *Cladosporium fulvum* [ibid., xviii, p. 769]. These types he has crossed with Bay State, a variety now highly susceptible to a variant strain of the fungus. Strains approaching desirability for greenhouse forcing appeared among the progeny of successive generations of crosses of Bay State with type No. 129882 from Peru and No. 112215 from Ecuador. Selected lines of these hybrids were crossed with Vetomold-121, Bay State, Waltham Forcing, and Marglobe. The best results were given by the crosses with No. 112215, and the F_3 generation will be grown in commercial greenhouse trials in the autumn.

When three plots of Blue Hubbard squash [*Cucurbita* sp.] were sprayed five times in an unusually dry season with Bordeaux mixture (4–4–50) plus 1 lb. calcium arsenate and spreader, the resulting yield, as in the previous year, was smaller than that from three corresponding unsprayed plots. Loss from decay in storage was negligible in fruit from all six plots, but shrinkage was greater among the sprayed than amongst the unsprayed squash.

L. H. Jones found that at a soil temperature of 70° F. mosaic-free Havana Seed tobacco leaves developed consistently in their normal ovate shape, whereas at 90° the newer leaves showed yellow spots and were light green, narrow, and very pointed, i.e., they showed frenching [ibid., xxv, p. 237]. Inoculation of healthy plants with juice from the frenched leaves gave no symptoms of mosaic, while controls inoculated with juice from mosaic-infected leaves developed mosaic symptoms. Plants grown at 70° having normal leaves soon produced frenched leaves at 90°, while others grown at 90° and showing frenched leaves produced some almost normal leaves at 70°.

Creosote injury to plants [unspecified] was found to be local. The fumes, arising from treated lumber exposed to the sun, pass into the leaves through the stomata and an exposed leaf may die. If, however, the injury occurs near the growing point, growth becomes arrested, and the plant dies unless it can develop lateral shoots, one of which becomes a leader.

H. E. White states that the Field Station strains of snapdragons [*Antirrhinum majus*] continue to show strong resistance to rust [*Puccinia antirrhini*: ibid., xxiii, p. 20]. Thirty selections of resistant lines gave only seven with rust and these showed only 10 to 25 per cent. infection. Cuttings of eight carnation varieties treated with hormodin powder No. 1, stimroot powder (spergon plus hormone), or fermate powder or liquid showed no difference in degree of rooting. The tests showed that too much hormone powder may cause cuttings to be more susceptible to rot diseases.

Continuing their work on mushrooms (*Agaricus* [*Psalliota*] *campestris*) W. B. Esselen, A. Filios, W. H. Fitzpatrick, and E. Weir showed that they contain approximately 203 mg. argenine, 458 mg. isoleucine, 242 mg. leucine, 144 mg. methionine, 5 mg. tryptophane, and 326 mg. valine per 100 gm. fresh weight. The total nitrogen was about 0·5 per cent., of which 63 per cent. was protein, purified mushroom protein having 11·79 per cent. nitrogen. It was concluded that fresh mushrooms contain approximately 2·67 per cent. protein. Commercially canned mushrooms (18 different samples) averaged 0·249 mg. riboflavin, 1·8 mg. nicotinic acid, and 0·83 mg. calcium pantothenate per 100 gm. total can content, the biotin content averaging 6·57 micrograms. In canning, blanching in hot water caused little or no loss of the B-vitamins, but there was significant loss in processing, while storage in cans for one year caused some loss of riboflavin but little or none of nicotinic acid, calcium pantothenate, and biotin.

Orton (C. R.). **Biennial Report of the Director, West Virginia Agricultural Experiment Station, Morgantown, for the period 1942–1944.**—*Bull. W. Va agric. Exp. Sta.* 317, 56 pp., 19 figs., 1 map, 1944.

In the section of this report [cf. *R.A.M.*, xxiii, p. 27] dealing with plant diseases (pp. 34–40) it is stated that J. G. Leach has devised a method of inoculating large numbers of bluegrass [*Poa pratensis*] plants with stripe smut [*Ustilago striiformis*: ibid., xxii, p. 485; xxiv, p. 318]; experiments are in progress in which promising resistant selections are being tested and susceptible plants eliminated.

L. H. Leonian and V. G. Lilly, using differential growth rates of bacteria and fungi, including yeasts, to detect and assess vitamins in foods, have demonstrated that certain [unspecified] fungi are so sensitive that a few parts per billion of B-complex vitamins suffice to permit their growth.

Several years' study of potato purple top have proved conclusively that it is caused by the aster yellows virus [ibid., xxiv, pp. 70, 406]. It is transmitted to potatoes by the aster leafhopper [*Macrosteles divisus*], and has a long incubation period in the potato, with the result that the disease does not appear until late in summer. Early potatoes escape with slight injury, while late varieties may show great reduction in yield and quality. J. G. Leach found that infection must occur early in the season in order to produce injury. The disease is not perpetuated through the tubers, but tubers from infected plants give weak plants.

Jones (W.). **Check list of plant diseases in the coastal areas of British Columbia.**—B.C. Dep. Agric., 27 pp., 1945. [Mimeographed.]

This check list of plant diseases affecting over 200 host plants is based on data collated in connexion with periodic plant disease surveys of the coastal areas of British Columbia during the last ten years, the names of the diseases being listed in Latin and English under the Latin names of the hosts, together with the local distribution; an index of the common names of host plants is provided.

Newton (Margaret) & Johnson (T.). **Physiologic races of Puccinia graminis tritici in Canada, 1919 to 1944.**—*Canad. J. Res.*, Sect. C, xxiv, 2, pp. 26–38, 1 fig., 1946.

During the period 1919 to 1944, 65 physiologic races were identified from 4,543 isolates derived from uredial collections of *Puccinia graminis* var. *tritici* [*R.A.M.*, xxv, p. 298]. In the Prairie provinces 49 races were recorded from 3,475 isolates; 40 in Eastern Canada from 1,013; and 12 in British Columbia from 55. Races 36, 17, and 21 were largely responsible for the severe losses suffered by Marquis and other common wheats during the period 1920 to 1930, and races 34 and 49 were frequently collected from 1927 to 1935, but all of them declined in pathogenicity between 1930 and 1936, whereas race 56, first recorded in Canada in 1931, has been the dominant rust pathogen since 1934, notably in the epiphytotic of 1935. Race 17 revived and challenged the pre-eminence of race 56 as a pathogen in 1941, but soon ceased to be serious [cf. ibid., xxiv, p. 222].

The distribution of races is similar, but not identical, as between eastern and central Canada; 36 and 21 are more common in the Prairie provinces than in the east, while the opposite is true of 38. Only about a dozen of these races can be considered as having serious economic importance and at least two-thirds of the others have only been found occasionally and have, for reasons which have not yet been ascertained, failed to secure even a limited distribution.

The presence of the common barberry in Eastern Canada is thought to offer some explanation of the rather greater variety of physiologic races of *P. graminis* found there, as compared with the Prairie provinces.

Johnson (T.). **The effect of DDT on the stem rust reaction of Khapli Wheat.**—*Canad. J. Res.*, Sect. C, xxiv, 2, pp. 23–25, 1 pl., 1946.

Seedling leaves of wheat varieties in the greenhouse at the Dominion Laboratory of Plant Pathology, Winnipeg, were sprayed with DDT (dichlorodiphenyl trichloroethane) (1 oz. to 5 gals. water) four days after being infected with race 17 of *Puccinia graminis tritici*. Ten days after spraying, uredosori somewhat larger than the minute type-1 pustule usually produced by race 17 on Khapli (*Triticum dicoccum*) appeared on that variety and in 24 days it appeared to be fully susceptible. Only Arnautka of the resistant wheats tested showed any similar tendency to susceptibility after DDT spraying which also appears to have induced a marked chlorosis on the leaves of some of these wheats, but not on those of others. On sprayed Khapli leaves there seemed a marked connexion between chlorosis and rust development. The possible effect of DDT insecticide on the reactions of hosts to fungi should not be overlooked.

Yu (T. F.), Wang (H. R.), Fang (C. T.), & Yin (S. Y.). **Studies on physiologic specialization in Tilletia tritici and T. levis in China.**—*Chin. J. sci. Agric.*, i, 4, pp. 281–287, 1944. [Received June, 1946.]

The information on wheat bunt (*Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*]) presented in this paper has already been noticed from another source [*R.A.M.*, xxv, p. 208].

Foëx (É.). **Un champignon à sclérote du Blé. Son action parasitaire.** [A sclerotial fungus of Wheat. Its parasitic action.]—*Ann. Épiphyt.*, N.S., vii, 1, pp. 21–42, 21 figs., 1941. [Received April, 1946.]

In June, 1938, the author received from Ain [France] specimens of wheat plants injured by cold before earing and showing white lesions surrounded by brown zones on the lower internodes. These lesions contained a fungus with hyaline, septate, cylindrical or varicose, inter- and intracellular hyphae of varying diameter and small, black sclerotia.

A comparative study of the cultural characters of this fungus and of those of *Sclerotium rhizodes* [*R.A.M.*, xviii, p. 34] and *S. costantini* [ibid., xviii, p. 372] showed that the mycelium of the first was white, relatively thick, and formed flocculent masses in places, while the sclerotia were generally isolated and sparse; the mycelium of *S. costantini* was less thick and did not form flocculent masses; the sclerotia were more numerous, of medium size, isolated or in groups, and seldom formed large masses. In the Ain fungus the mycelium formed a thin layer, difficult to see, sclerotia were even more numerous, single, or, generally, in groups. At 22° C. *S. rhizodes* grew more slowly than the other two fungi. Increases in the colony diameters after 10 days at 24° to 25° for the Ain fungus, *S. costantini*, and *S. rhizodes* were, respectively, 124 to 130, 110 to 121, and 27 mm.

The sclerotia of *S. rhizodes* measured 800 to 1,550 μ wide and 550 to 1,000 μ high, as against 550 to 900 by 300 to 650 μ, for *S. costantini*, and 250 to 650 by 100 to 350 μ for the Ain fungus. The three types of sclerotial fungi differed also in their anatomical structure.

Experimental inoculations of Bon Fermier wheat and Probstdorf barley seedlings in pots under glasshouse conditions were made by inserting a pure culture of the Ain fungus in the soil. It showed great virulence, many inoculated plants being killed, and numerous sclerotia being produced.

The author considers that although there are differences between the Ain fungus, *S. costantini*, and *S. rhizodes*, they cannot be considered as distinct species. All three present certain analogies with the organisms which Samuel and Garrett in Australia and Sprague in Oregon have referred to *Rhizoctonia* [ibid., xii, p. 159; xvi, p. 801; xix, p. 74], while the lesions described by Sprague resemble those

caused by the Ain fungus and *S. costantini*. In a letter to the author (quoted in a footnote) Whetzel suggested that the author's culture of *S. costantini* sent to him might be closely related to *S. rhizodes*, which, while a true species, is closely related to *R.* [*Corticium*] *solani*, and of which it may be a variety. A comparison of the author's *S. costantini* and *S. rhizodes* showed, however, that these two were not identical. Whetzel suggested that the Ain fungus should be either referred to *C. solani*, or regarded as a slight variant of *S. costantini*, if it was desired to retain this species. He thought it likely that a variety of strains of *S. costantini* (or as he prefers, *C. solani*) might be isolated from different localities in France. The author inclines to agree with Whetzel, but prefers not to come to a definite conclusion as he lacks material for comparison.

Foëx (É.). **Revue des travaux sur diverses maladies des céréales déterminées par des champignons à sclérotes.** [A review of the work on different cereal diseases caused by sclerotial fungi.]—*Ann. Épiphyt.*, N.S., vii, 1, pp. 43–53, 1941. [Received April, 1946.]

The author succinctly reviews and discusses investigations carried out by numerous workers on the cereal diseases due to *Typhula itoana* [*R.A.M.*, xix, p. 434], *Sclerotinia graminearum* [ibid., xviii, p. 581], *Sclerotium rhizodes* [see preceding abstract], and *S. rolfsii*, a separate bibliography being appended to the account of each disease.

Hagborg (W. A. F.). **The diagnosis of bacterial black chaff of Wheat.** *Sci. Agric.*, xxvi, 3, pp. 140–146, 4 figs., 1946.

With a view to avoiding the confusion which has occurred among diseases resembling black chaff of wheat (*Xanthomonas translucens* f. sp. [var.] *undulosa*) [*R.A.M.*, xvi, p. 91], for example, *Septoria* glume blotch (*S. nodorum*) [ibid., ii, p. 211], brown necrosis (*Helminthosporium sativum*), *Alternaria* blotch [*A. tenuis*: ibid., xxii, p. 15], pseudo-black chaff [ibid., xii, p. 561], basal glume rot (*Pseudomonas atrofaciens*) [ibid., xvi, p. 91], and internodal melanism, methods are outlined for its diagnosis. They embrace macroscopic and microscopic examination of the diseased tissues and bacterial smears, the isolation of the causal organism, and its determination on the basis of its pathogenic and serological reactions and its morphological and physiological properties. For the pathogenicity tests Thatcher wheat, Victory oats, Star barley, and Prolific (Spring) rye are recommended, and for the serological tests the author used a phenolated physiological salt solution.

Bowman (D. H.). **Sporidial fusion in Ustilago maydis.**—*J. agric. Res.*, lxxii, 7, pp. 233–243, 2 figs., 1946.

In this study, undertaken to determine the conditions conducive to sporidial fusion of *Ustilago maydis* in culture and the subsequent nuclear behaviour, the fusion of compatible sporidia or hyphae was found to depend on nutrition and temperature [*R.A.M.*, xi, p. 569], which conditioned the time required for fusion to occur. Fusions began after 15 hours in distilled water or 1 per cent. malt extract at 20° to 24° C. and were readily observed after 20 to 48 hours. Lower temperatures delayed fusion and none occurred below 12°, while at higher temperatures rapid vegetative budding obscured the fusions.

Observations of the nuclear behaviour of *U. maydis* showed that at the time of fusion, or immediately after, the nucleus in each of the fusing gametes divided, and a daughter nucleus from each entered the fusion tube or cell, which was then cut off by walls. The binucleate hypha, each cell of which contained one pair of nuclei, then grew out. The present studies did not support the view frequently suggested

that the protoplasmic contents of the fused sporidia pass into the fusion hyphae and progress toward the tip as growth develops, leaving empty cells behind.

WHITE (N. H.). **The etiology of take-all disease of Wheat. 1. A survey of a take-all affected field at Canberra, A.C.T. 2. Progressive necrosis and microfloral succession in root and crown tissue of Wheat.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 4, pp. 318–328; 329–335, 3 figs., 1 graph, 1 pl., 1945.

In the first of these papers the author records some preliminary observations made during a detailed survey from 1939 to 1942 of a wheat field at Canberra affected with take-all, beginning with the first year's cropping after conversion from a savannah-woodland natural pasture. Although affected plants occurred singly or in small groups throughout the field, they were more noticeable in large, irregular, well-defined areas. Soil samples from these and adjacent healthy parts of the field showed no significant differences in physical condition, organic carbon and nitrogen content, or P_H reaction. Of plants taken at random from both areas, 64 per cent. from the former and 7 per cent. from the latter developed perithecia of *Ophiobolus graminis* [*R.A.M.*, xxv, p. 210] on the culm bases, though platings from both lots gave other fungi, the species of which and their frequency in the two lots were identical. The organisms obtained included *Fusarium culmorum* and *Helminthosporium sativum*.

While in the first two seasons the affected patches were in well-defined areas, in the next two the diseased plants were more widely and uniformly distributed. The position of the affected areas shifted from season to season, though they tended to overlap in succeeding years.

Seedling-blight symptoms were invariably associated with the presence of *O. graminis*. The distribution of plants with such symptoms was significant, the clustering suggesting the presence of a locality factor, probably foci of inoculum. The evidence indicated that local soil differences other than those studied, and the location of foci of inoculum of *O. graminis*, may determine the position of take-all patches in the field.

In the second paper records of the health ratings and samplings of selected areas at eight stages of development from seedling to stubble in the 1941 season are given. These showed that the seminal roots, crown roots, and crown tissues became progressively diseased in number and extent (and in that order) as the crop developed. At the ripe stage all plants had root lesions but only 17 per cent. were white-eared; these had most severe root necrosis. Lesions in these tissues gave cultures of *O. graminis* at first, but later samples yielded less of *O. graminis* and more of other fungi. At the stubble stage *F.* spp. were always dominant. Parallel platings of healthy tissues at first showed no organisms present, but when the tissues became mature and senescent, they were populated with fungi and bacteria resembling those found in diseased tissue but never with *O. graminis*.

The results of this study fully confirm Garrett's view [ibid., xvi, p. 306] that the relation between *O. graminis* and other soil inhabitants should be regarded from an ecological standpoint, and that there seems to be a regular succession in diseased wheat roots, the initial cause being the presence of *O. graminis*, the lesions produced by which provide a non-living substratum suitable for the growth of saprophytes. These appear unfavourable to the growth of *O. graminis*, runner hyphae from which invade further healthy tissue, producing new lesions, and again the replacement is repeated. The character of the succession in each lesion depends on the climatic conditions of the rhizosphere, mainly aeration, temperature, moisture, and P_H reaction. Fungi isolated from the basal parts of mature wheat plants with take-all symptoms may not necessarily be causally related to the disease, but may represent a climax of fungal development terminating the microfloral succession following the entrance of the primary parasite.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1941–42*, Part II, pp. 31–59, 2 figs., 1 diag., [? 1942. Received March, 1946].

Among many items of phytopathological interest in this report (cf. *R.A.M.*, xxiv, p. 365] the following may be mentioned: R. H. PORTER and W. N. RICE found that in soil naturally infected with *Pythium* spp. and maintained at high moisture content the germination of maize was lowered by low temperature (10° to 12° C.). The use of spergon and 1 per cent. ethyl mercury phosphate [new improved ceresan] assured satisfactory protection against *Pythium* spp.

Field stands of sorghum were improved by seed treatment with spergon, copper carbonate, or 0·5 per cent. ethyl mercury phosphate.

Poor stands from seed maize which had tested well for germination were found on investigation by L. A. TATUM and G. F. SPRAGUE to be due largely to injury to the pericarp over the germ. The damage was attributed to rough processing and handling and was greater when the moisture content was below 14 per cent.

In virulence tests with 72 cultures of 41 transfers of three single-cell strains of *Phytomonas* [*Xanthomonas*] *stewarti* carried on for 15 months, E. W. LINDSTROM showed that a bacterial variation became evident in the fourth transfer and ultimately all three strains developed a striking colony variation. In the agar medium two levels of P_H were employed at 7·0 and 8·0 to 8·4 and three of glycine at 0, 0·04, and 0·8 per cent. The colony morphology varied significantly in subcultures of each of the three lines and there were even variations in colony colour. Cultures of these six treatments (and of the originals as controls), with duplicates of each of the three strains, were tested after the 23rd and 41st transfers on a highly susceptible inbred variety grown in randomized blocks with three replications of eight plants. Each plant was inoculated hypodermically, and the results are presented in a lesion table. Differences, often considerable in the case of the virulent strains, were usually towards a marked attenuation. With both virulent strains virulence tended to increase with the higher P_H but not with the avirulent strain. The general conclusion is that bacterial virulence is more likely to be selected by the fixation of bacterial mutants in a test tube rather than by environmental influences of P_H or glycine.

C. S. REDDY demonstrated in laboratory and greenhouse tests the superiority of spergon, used at 1½ oz. per bush., over other seed treatments for the protection of maize both before and in the course of germination.

In experiments reported by I. E. MELHUS and G. C. KENT triethanolamine oleate, butylamine oleate, potassium oleate, dupanol 80, and W. S. Dupont exerted the least fungicidal activity and a nearly maximum surface tension depression at 0·4 per cent. concentration in laboratory tests to assess the value of various surface tension depressants in facilitating the penetration of inoculum of *Ustilago zeae* [*U. maydis*] into susceptible tissue within the leaf whorl. To obtain infection of seedlings in the shortest possible time the tip of the coleoptile was cut off and the leaves exposed or the young leaves were allowed to pierce the coleoptile or to reach the two- to three-leaf stage before inoculating; no depressant was necessary. Infection of young maize plants can thus be achieved at an age of 5 to 7 days, the symptoms occurring 7 to 14 days after inoculation, or 12 to 21 days after planting.

Spore collections made in 1941 of the fungus formerly described as *Basisporium gallarum* are all referred by C. S. REDDY to *Nigrospora oryzae* [cf. ibid., xvii, p. 670; xxi, p. 368]. The wide variability precludes their segregation into two species.

In studies by G. SEMENIUK *et al.* highly significant differences in the rotting of the pith of 49 crosses of dent maize, previously greenhouse-tested for seedling reaction to *Diplodia zeae*, were noted following field inoculation of the stalks of these plants with *D. zeae* in August, 1941. There were also wide differences in the percentage of dead stalks in the uninoculated plants at the three dates on which

statistics were taken. A very dry July and August, followed by a very wet September and October, rendered the disease more epiphytotic than in 1940. The data collected showed no particular correlation between greenhouse seedling reaction and field results for spread of *D. zeae* in the pith and the percentage of dead stalks. There was a highly significant correlation between the development of the fungus in the pith and the percentage of dead stalks in uninoculated plants.

In the two surveys of stored maize [ibid., xxiv, p. 364] G. Semeniuk found species of *Aspergillus*, *Penicillium*, *Fusarium*, *Oospora*, *Gibberella*, *Basisporium*, and *Helminthosporium* present in the first lot of 60 bins, while *Penicillium*, *Mucor*, *Aspergillus* spp., and bacteria predominated in the second series of samples. Growth of several of the fungi occurred at from 5° to 40° C. on potato dextrose agar, indicating that deterioration can occur at very low and high temperatures. Germination tests of samples of stored maize from the upper half of bins attacked by moulds showed complete loss of viability in 7 bins, less than 50 per cent. germination in 20, and under 75 per cent. in 38, the loss of viability being usually in inverse proportion to the depth of maize in the bin.

McLaughlin (J. H.). **Corn seed treatment in Oklahoma.**—*Bull. Okla. agric. Exp. Sta.* B-294, 14 pp., 1 fig., 1946.

Chemical dust seed treatment tests were undertaken from 1943 to 1945 by several agricultural experimental stations of the southern United States under the auspices of the Oklahoma Station.

In 1943 the dusts tested were arasan, Du Bay 1451-D, spergon, semesan jr., and barbak-D, arasan and Du Bay having not been tested previously on maize seed [cf. above, p. 332]. Seedlings, which were not very vigorous, planted on 19th April in soil below optimum temperature, suffered loss from soil pathogens following heavy rain and lowered soil temperatures from 1st to 5th May. The seedling count on 28th May showed beneficial results from all the seed treatments, Woods Golden Dent showing 31 per cent. increase. In a second test of treated seed planted on 4th June under optimal conditions for germination Golden Queen and Woods Golden Dent proved unresponsive to treatment, but 10 per cent. increases were recorded for Hays Golden, Mosby, and Jarvis Golden Prolific varieties.

Tests with the same dusts, apart from arasan, with early (31st March), medium (6th April), and late (18th April) plantings in 1944 on five different seed lots, using five replications, showed semesan increasing seedling stands of Woods Corn by 56 and 29 per cent. in the two later plantings, although wider success attended spergon, notably with Woods Corn, Louisiana Hybrid 468, and Hastings Prolific, and Du Bay was a good second to these. The planting for 6th April was followed by increased yields from treated grain of at least 10 per cent. in half the possible instances. Tests in 1943 and 1944 with eight different dusts at rates of application varying from $\frac{3}{8}$ to $2\frac{1}{2}$ oz. per bush. of seed showed no material differences between the various rates for any one chemical.

In tests with Hays Golden and Golden Queen seedling emergence and yields were increased by 10 per cent. or more by using arasan, USR 604, and yellow cuprocide at 1 oz. per bush. seed; semesan jr., barbak C, and Du Bay 1451-D at $1\frac{1}{2}$ oz. per bush.; and dow 9 A and 9 B at 2 oz. per bush.

In 1943, 78, 78, 71, 68, 64, and 91 isolations of fungi from the mesocotyls of seedlings were made per 100 plants treated respectively with arasan, spergon, semesan jr., barbak D, Du Bay 1451-D, and from non-treated seed. Most of these fungi were *Fusarium moniliforme* [*Gibberella fujikuroi*], giving 30 to 83 isolations per 100 plants.

Isolations of *Diplodia zeae* [*R.A.M.*, xxii, p. 475] were two for arasan, five for semesan jr., and one for Du Bay 1451-D, there being no *D. zeae* isolations per 100 plants treated with spergon, barbak D, or left untreated. Other isolations

included *Cephalosporium acremonium* and saprophytic species of *Rhinotrichum*, *Penicillium*, and *Fusarium*. Spergon (non-volatile) did not appear as effective as volatile chemicals.

LEWIS (H. C.). **Spray injury from zinc-lime sulphur in central California.**—*Calif. Citrogr.*, xxxi, 4, p. 112, 1 fig., 1946.

The addition of zinc oxide to lime-sulphur for the control of mottle leaf in citrus orchards [*R.A.M.*, xvii, p. 743] has caused light injury to oranges. This zinc-lime-sulphur burn or 'scratching' is different from the typical lime-sulphur burn in that it is much less severe, is confined to small scars or irregular scratches or, if severe, to elongated sunken scars on the fruit, and is common in cool weather. In one experiment spraying with 2 per cent. lime-sulphur alone caused injury sufficient to reduce the grade of 6 per cent. of the fruit. The addition of 1 lb. and 2 lb. zinc oxide per 100 gals. increased this percentage to 13 and 35, respectively. Substitution of the oxide by zinc sulphate at the rate of $2\frac{1}{2}$ to $3\frac{1}{2}$ lb. gave no improvement, but when as much as 7 lb. was added the fruit damage was lowered to 0·5 per cent., due to the neutralization of the lime-sulphur by the zinc sulphate. This spray applied in early spring at petal-fall should give good control of insects and mottle leaf, and eliminate scratching and lime-sulphur burn.

DE URRIÉS Y AZARA (M. J.). **Acerca de una coniothyriosis de la Naranja.** [Concerning a coniothyriosis of the Orange.]—*An. Jard. bot. Madr.*, v, pp. 140–142, 1 pl., 1 fig., 1945.

The epicarp of one of three oranges from the province of Badajoz, Spain, submitted to the writer for inspection, presented a large, pale, ochre-coloured area with a greenish halo, while the two others bore sunken lesions blackened by the superimposition over the original infection of an extraneous sooty mould mycelium. A species of *Coniothyrium* was isolated from the affected tissues, but inoculation experiments on ripe oranges gave negative results. It is named *C. pax-augustanum* n. sp. and is characterized by globose, depressed pycnidia, 130 to 220 μ in diameter, a black parenchymatous context, and broadly ellipsoid or sub-globose, dark brown conidia, 8 to 10·5 by 6 to 8 μ, the shape and dimensions of which distinguish them from the similarly coloured ones of *C. fuscoatrum*.

CHEO (C. C.). **Verticillium wilt of Cotton in Yunnan.**—*Chin. J. sci. Agric.*, i, 4, pp. 258–263, 2 figs., 1944. [Chinese, with English summary. Received June, 1946.]

A pseudosclerotia-forming fungus tentatively identified as *Verticillium dahliae* was detected on cotton (*Gossypium barbadense*) for the first time in China at Mengtse, Yunnan, in 1939. The pathogenicity of the fungus was demonstrated by inoculation and re-isolation experiments. Of nine plants used in host-range tests, only eggplant contracted infection from the cotton strain of the organism. Seeds from diseased plants were proved not to constitute a source of contamination. A strain of Egyptian cotton immune from the wilt was discovered by means of greenhouse resistance trials.

DRECHSLER (C.). **A clamp-bearing fungus parasitic and predaceous on nematodes.**—*Mycologia*, xxxviii, 1, pp. 1–23, 7 figs., 1946.

Continuing his researches on Hyphomycetes parasitic on nematodes [*R.A.M.*, xxi, p. 15], the author describes a new species of fungus occurring on decaying leaves of cucumber and other plants in Colorado, and named by him *Nematoctonus haptocladus*. The organism captures and devours various nematodes, notably *Panogrolaimus* sp., which it destroys in a free condition.

Drechsler (C.). **Three new Zoöpagaceae subsisting on soil amoebae.**—*Mycologia*, xxxviii, 2, pp. 120–143, 6 figs., 1946.

The morphology and behaviour of three additional members of the family Zoöpagaceae [*R.A.M.*, xx, p. 462; xxi, p. 488] are critically described, namely, *Cochlonema agamum*, n. sp., *Acaulopage lophospora*, n. sp., and *A. hystricospora*, n. sp. *C. agamum* is an endoparasitic fungus on soil amoebae and occurs on decaying leaves of cucumber and *Syringa* sp. in Colorado. *A. lophospora* and *A. hystricospora* also capture and consume amoebae and are found, respectively, on *Syringa* sp., *Populus* sp., and *Tamarix* sp. in Colorado and on pansy in Maryland.

Millikan (C. R.). **Zinc deficiency in Flax.**—*J. Dep. Agric. Vict.*, xliv, 2, pp. 69–73, 88, 5 figs., 1946.

Flax in Victoria, particularly in the Portarlington district, in each of the seasons 1942 to 1945 showed symptoms of zinc deficiency [*R.A.M.*, xxiii, pp. 249, 436]. Bronze-coloured spots appeared on the upper leaves four to six weeks after germination, generally associated with or preceded by a rusty-brown discoloration of the top of the stem. Die-back, with or without foliar discoloration, occurred. Resumed growth often developed so well that the crop reached standard length and was duly harvested.

An extensive field experiment, with Liral Crown flax, to investigate the effect of time of sowing and zinc and phosphate manurial treatments showed that incidence was highest in the June sowing, whereas progressive and significant reductions in the percentages of both 'die-back' and 'total zinc deficiency' occurred in the July and August sowings. The symptoms were least marked in the August sowing.

Dressings of zinc sulphate at 30 lb. per acre exerted a considerable degree of control. Superphosphate dressings by themselves had no effect, but when applied at the rate of 10 cwt. per acre in conjunction with 30 lb. zinc sulphate per acre, there was a significant increase in the incidence of the symptoms over that occurring with zinc sulphate alone.

Neergaard (P.). **Nye eller upaaagtede Prydplantesygdomme i Danmark. 13–18.** [New or unheeded ornamental plant diseases in Denmark. 13–18.]—*Gartnertidende, 1943*, 8, pp. 95–98, 3 figs., 1943. [Received June, 1946.]

Further information is presented on some diseases of ornamental plants in Denmark either new to the country or previously overlooked [cf. *R.A.M.*, xx, p. 579 and next abstract]. *Gloeosporium physalospora* Cav. occurs in a destructive form on indoor plants of *Cissus antartica*, causing a wilt of the main shoot extending down the stem. The infection had presumably originated in the nursery and continued to develop under room conditions.

Peronospora arthuri, a new record for Denmark, was first observed on *Clarkia elegans* [ibid., xvii, p. 114] in July, 1940, and recurred with great severity under particularly adverse conditions for the host in 1942, when the financial damage sustained by nurserymen in various localities of Zealand was estimated at Kr. 5,000. Several varieties of *C. elegans* were affected, including Alba, Brilliant, Glorious, Ruby, and Salmon and Scarlet Queens, whereas adjacent plantings of *C. pulchella* and its var. *rubra* and the related *Godetia hybrida* were free from attack. The fungus spreads from the lower to the upper leaves, forming on the under sides flocculent patches of mould, white at first, later grey with a faint purple cast, and ultimately brownish-grey, and on the upper ones diffuse, pale yellowish areas. In the final stages of the disease the leaves are shed. The oospores of the fungus may persist in the soil for several years, necessitating the lapse of a protracted period between one planting of *C. elegans* and the next. Another wise precaution

(the disease being probably, though not certainly, seed-borne) consists in seed disinfection by half an hour's immersion in 0·5 per cent. uspulun. Unduly close spacing should be avoided in order to permit the free circulation of air between the plants. Spraying or dusting should be started in good time before flowering and continued throughout the growing period.

Clivia miniata is subject to a disorder of obscure etiology known as 'marginal spot', the initial symptom of which is the formation along the leaf margins of scattered, clear, yellowish spots, 1 mm. in diameter. Later more or less extensive, often very irregular, sharply delimited areas of the leaf develop intensive bleaching, turning from yellow to brown and eventually shrivelling, with the original small spots now dark brown and well defined. Another disturbance liable to confusion with the foregoing, known as 'cork disease', is characterized by the development on the foliage of numerous small, brownish, irregular, suberized, slightly raised areas.

The vegetable marrow leaf spot caused by *Septoria cucurbitacearum* was observed for the first time in Denmark causing severe infection in a Copenhagen market-garden in September, 1942.

A foliar spotting of ivy (*Hedera helix* var. *hibernica* f. *variegata*) due to *Amerosporium trichellum* (Fr.) Lind has been prevalent in the country since the eighties of last century, but in August, 1941, the pathogen was detected in a new form causing stem desiccation. Control measures are briefly indicated.

Pansies (*Viola tricolor* var. *hiemalis*) in a south Jutland market-garden sustained heavy damage in November, 1942, from a leaf spot produced by *Centrospora macrospora* (Osterw.) n. comb. (syn. *Cercospora macrospora* [and see *Ansatospora*: ibid., xxiv, p. 305]; *Centrospora ohlsenii* Neerg. in *Zbl. Bakt.*, Abt. 2, civ, pp. 407–412, 1942), which had already been present on the same site for the past three or four years. The immature seeds in several capsules of the plants submitted for examination were contaminated by the fungus, so that seed disinfection should be one of the control measures adopted, while soil sterilization to destroy the perennating mycelium is also recommended.

NEERGAARD (P.). **Stueplanternes Sundhedspleje. En Statistik over Forespørgsler om Sygdomme og Skadedyr paa Stueplanter.** [Hygiene of indoor plants. Statistics of queries concerning the diseases and pests of indoor plants.]—*Gartnertidende, 1943*, 17, pp. 205–206, 3 figs., 1943. [Received June, 1946.]

During the period from 1939 to 1943 the writer dealt with a number of queries concerning the health of indoor plants in Denmark [see preceding abstract], and further information on this subject was supplied by N. F. Buchwald, who was engaged on similar problems. Of 347 requests for advice, 209 related to physiogenic disorders of various kinds and only 24 to fungal or bacterial infections, the former of which included *Gloeosporium affine* on *Hoya carnosa*, *Exobasidium japonicum* on azalea [*Rhododendron*], *Oidium begoniae* on *Begonia* [see next abstract], *Phyllosticta aspidistrae* on *Aspidistra*, and *Sphaerotheca fuliginea* on *Veronica myrtifolia*.

ZOBRIST (L.). **Begonien-Mehltau.** [Begonia mildew.]—*Gärtnermeister*, xlix, 3, pp. 17–19, 6 figs., 1946.

Begonia mildew, caused by *Erysiphe polyphaga* (*Oidium begoniae*) [*R.A.M.*, xxv, p. 236], is responsible for more or less severe damage to a number of varieties in the Zürich district of Switzerland, among the most susceptible being two types of Gloire de Lorraine, namely, Eges Favorit and Schnee, *B. elatior* (various), *B. bertinii*, *B. hybrida-multiflora* (Salmon Glory), and *B. tuberosa-hybrida* (various). Satisfactory control may be effected by three monthly prophylactic treatments with 0·1 per cent. cupromaag plus 0·3 per cent. deril (an insecticide and wetter).

Massey (L. M.). **Brown-canker control.**—*Amer. Rose Annu., 1945*, pp. 147–150, 1 fig., 1945.

Brown canker (*Cryptosporella* [*Diaporthe*] *umbrina*), the agent of considerable damage to roses in the United States [*R.A.M.*, xviii, p. 41; xxii, p. 24], may be effectively combated by the following control schedule (also applicable to stem canker, caused by *Coniothyrium fuckelii*): attention to drainage, exposure, manuring, and other cultural practices for the maintenance of normal vigour; prompt removal and destruction of all dead and sickly material; systematic spraying for disease and insect extermination; care in the avoidance of injury to stems; and thorough scrutiny of large, old plants, e.g., of *Rosa setigera*, which are commonly placed at the back of the shrubbery and thus tend to escape observation. Drastic pruning is probably preferable to light for brown-canker control. Under suitable moisture and temperature conditions the fungus can enter the plants through uninjured tissues, hence the value of protective fungicidal treatments, as applied against black spot [*Diplocarpon rosae*].

Guba (E. F.). **Carnation wilt diseases and their control.**—*Bull. Mass. agric. Exp. Sta.* 427, 64 pp., 14 figs., 1945.

This comprehensive monograph classifies the principal fungal diseases of carnations [*R.A.M.*, xxii, p. 387; xxiii, p. 389] recorded in Massachusetts, namely, spot, blight, and canker caused by *Alternaria dianthi*; root and crown rot caused by *Fusarium avenaceum*, *F. culmorum*, and other *Fusarium* spp.; branch rot or wilt caused by *F. dianthi*; and stem rot caused by *Rhizoctonia* [*Corticium*] *solani*; describes their symptomatology and history, the temperature relations which favour their pathogenicity and mode of infection; discusses the selection, preparation, and disinfection of cuttings; and investigates the age of plants in relation to disease and yield, cultural methods, disease resistance, soil sterilization, and measures for disease control.

Distinctive as are the symptoms of these pathogens, wilting is the common result of their incidence. Injuries to roots, stems, and branches and notably the incised surface at the base of cuttings, invite attack by *A. dianthi*, *F. culmorum*, *F. dianthi*, and *R.* spp., and the first and last-named may infect uninjured plants in humid atmospheric conditions. Except in the case of *C. solani*, disease incidence in cuttings and young stock results largely from infection latent therein or from superficial spore inoculum, and is derived from unhealthy stock plants or from normal plants near unhealthy specimens.

New, clean sand should be used after each crop of rooted cuttings; plants should be cut smoothly and cleanly, leaving no loose ends of tissue; and the most effective general control of disease is immersion for 15 minutes in a 1 in 1,000 solution of potassium permanganate ($\frac{1}{4}$ oz. to 2 gals. water). Dusting the base of cuttings with a 10 per cent. fermate or arasan application controlled wilt caused by *F. dianthi* without harming the root action.

Cultivation in the greenhouse throughout the year is considered to decrease the dangers from *Alternaria* blight inherent in field planting; and transplanting from greenhouse to field should take place not later than the first week in July, care being essential in so doing to avoid injury. Old stock is most susceptible to injury and infection and less tolerant of changes and adverse conditions of growth. High temperature and humidity, often met with from July to September, encourage wilt disease, and the stem-rot fungus *C. solani* is dangerous where plants are set deeper than the roots.

Careful tending of young and flowering plants, discarding of all progressively infected stock, segregation according to the age of plants, and cultivation of resistant varieties are assets in disease control.

Lists of varieties resistant to *A. dianthi* and *F. dianthi* are given. Sterilization of potting and flatting soil by suitable methods is desirable.

Conidia of *A. dianthi* were killed by powdered naphthalene, copper compounds, and calcium arsenate; lead arsenate, lime, and sulphur fungicides were non-toxic. Bordeaux mixture with calcium arsenate and fish oil and dusting mixtures containing naphthalene, calcium arsenate, monohydrated copper sulphate, and lime controlled *Alternaria* blight in small-scale tests; and Bordeaux mixture 4–4–50 with 1 lb. calcium arsenate and ½ pint penetrol gave notable control of field epidemics. Calcium arsenate used alone was harmful and dusting materials unsatisfactory. Frequent treatments with a power-sprayer after fielding of plants in May and continued until benching time in the greenhouse, or until early July, are recommended, particularly for susceptible field-cultivated varieties.

WILHELM (S.), GUNESCH (W.), & BAKER (K. F.). **Myrothecium crown and stem canker of greenhouse Snapdragons in Colorado.**—*Plant Dis. Reptr*, xxix, 27, pp. 700-701, 1945. [Mimeographed.]

Wilting of leaves and flowering stems caused by *Myrothecium roridum* affecting from 2 to 3 per cent. of mature snapdragon [*Antirrhinum majus*: *R.A.M.*, xv, p. 157; xxiii, p. 191] plants in a commercial greenhouse at Denver during the autumn and winter of 1944 was accompanied by the characteristic symptoms of saturated lesions on the crowns, developing into depressed, dry, and cracked cankers, strewn with filamentous, white mycelium and black sporodochia, about 1 mm. in diameter, edged with white mycelium, and coalescing to form larger areas. In damp conditions or in a moist chamber, and on culture media these sporodochia appear in abundance, and *M. roridum* thrives in high humidity.

M. roridum has been reported commonly on *Viola* and pansy stems in England and on snapdragon stems [ibid., xvii, p. 590] in Texas and England. Since its description in 1790 it has been recorded on various hosts from Austria, Belgium, Ceylon, Germany, Hungary, Italy, Mexico, Sweden, and Switzerland. Its capacity to infect vigorous plants and notably unwounded *Viola* and pansies has been established, and its infection of snapdragons is seemingly similar.

Control is obtained by sanitation and suitable cultural methods, avoiding too much use of water and overhead spraying; using sterilized soil in field and greenhouse; and removing and burning infected plants.

SPRAGUE (R.). **Additions to the Fungi Imperfecti on grasses in the United States.**—*Mycologia*, xxxviii, 1, pp. 52–64, 2 figs., 1946.

The author gives descriptions of 13 Fungi Imperfecti on grasses in the United States, including seven species on *Septoria* (one new, namely *S. digitarivora*), three of *Stagonospora*, one being recorded as *S. agrostidis* forma *angusta* f. nov., *Ansatospora bromi* (Sprague) n. comb. proposed for *Cercospora bromi* on *Bromus rigidus*, and *Ovularia hordei* (Cav.) n. comb. for *Ophiocladium hordei* on *Phalaris arundinacea*. The last-named is said to cause an obscure disease of barley in northern Europe but has not been reported on barley in the United States.

SPRAGUE (R.). **Septoria disease of Gramineae in the western United States.**—151 pp., 19 figs., 2 pl., Oregon State College, Corvallis, Oregon, 1944. $1·50. [Received March, 1946.]

In this important monograph on the *Septoria* disease of Gramineae [cf. *R.A.M.*, xxv, p. 155 and preceding abstract], which attacks 94 species of grains and grasses in the western United States, the species are described, where the information is available, under the following headings: geographical distribution and economic importance, symptomatology, pure culture and artificial inoculations, morphology, and taxonomy, with tabulated data and critical commentary in respect of 21 species

and some varieties. The following are new: *S. quinqueseptata* n. sp., forming spots sometimes associated with *Darluca filum* and *Cercospora agrostidis* and collected on *Sphenopholis obtusata* in North Dakota in 1915; *S. jaculella* n. sp. on *Bromus* spp., very common west of the Rocky Mountains on the polymorphic host species, *B. carinatus*, and also recovered from *B. ciliatus* in Arizona, *B. laevipes* in California, *B. rigidus* in Oregon and Washington, and *B. tectorum* in Washington; *S. tritici* Rob. f. *avenae* n. comb., destructive to common oats and more severely to red oats (*Avena byzantina*). The wild oat (*A. fatua*) is highly susceptible and acts as a carrier in late winter; the disease has since been observed in eight counties in Oregon and has been found on common winter, red, and wild oats in Washington; *S. tritici* Rob. f. *holci* n. f. on *Holcus lanatus* in winter and spring in western Oregon and the adjacent area of Washington; *S. tritici* Rob. var. *lolicola* Sprague & A. G. Johnson n. var. on *Lolium perenne* and *L. multiflorum* in eight Oregon counties, and *S. loligena* n. n., a short-spored fungus on *L. multiflorum*, recovered near San Francisco in 1942: *S. calamagrostidis* f. *koeleriae* (Cocc. & Mor.) n. comb., producing an obscure leaf spot on *Koeleria cristata* in eastern Oregon, Washington, and Wyoming; *S. spartinae* (Trel.) n. comb. on *Spartina gracilis* in Utah and *S. pectinata* in South Dakota; *S. bromi* Sacc. var. *phalaricola* n. var. on reed Canary grass (*Phalaris arundinacea*) at the John Jacob Astor Experiment Station, Oregon, in 1934; *S. macropoda* Pass. var. *grandis* n. var. on nine species of *Poa*; and *S. pacifica* n. sp. on *Elymus mollis* in a restricted coastal region of Oregon, collected in 1935.

In determining species and their subdivisions the author is guided by the following considerations. The size and septation of the pycnospores is dependent on the weather, as are the colour, position, shape, and size of the pycnidia. The length to width ratio of the pycnospores is considered to be of taxonomic significance. Consistent, slight morphological variations are used only for making forms or races. Host range is not given the importance it has in more actively parasitic groups, although *Septoria* species tend to be restricted sometimes to certain grass tribes. Variations in pathogenicity are not given, therefore, critical consideration and pure cultures unless of the same age are considered to show little.

There is a key for distinguishing *Septoria* from related genera and for determining the species, with a bibliography of 122 authorities, an alphabetical list of hosts with their species of *Septoria* and occurrence in the western United States, and host and fungus indexes.

SCHULTZ (H.). **Arbeitsmethoden bei Kultur - und Infektionsversuchen mit Pythium-Arten.** [Techniques for culture and inoculation experiments with *Pythium* species.]—*Zbl. Bakt.*, Abt. 2, cv, 14–16, pp. 248–254, 1942. [Received May, 1946.]

In connexion with extensive studies on lupin foot rots in Germany, in progress since 1938, the writer worked out experimental methods for the large-scale isolation, culture, and pathogenicity tests of the numerous strains of *Pythium debaryanum* and other species associated with the disease-complex [*R.A.M.*, xxii, p. 161; cf. also ibid., v, p. 34].

GUYOT (A. L.). **Contribution à l'étude des formes de Puccinia rubigo-vera (DC.) Winter 1884 sensu lato (2ᵉ note) : observations morphologiques et biologiques sur les formes parasites des Bromus (note complémentaire).** [Contribution to the study of the forms of *Puccinia rubigo-vera* (DC) Winter 1884 *sensu lato* (2nd note): morphological and biological observations on the forms parasitic on *Bromus* (supplementary note).]—*Ann. Éc. nat. Agric. Grignon*, Sér. 3, ii, pp. 75–123, 8 figs., 1940–41. [Received January, 1946.]

In summarizing the results of critically annotated studies (continued from *Ann. Éc. nat. Agric. Grignon*, Sér. 2, i, pp. 67–74, 1937, and *Uredineana*, i, 1938), which

are fully tabulated and supplied with a bibliography of 49 titles, the author considers the various morphologic forms and physiologic races of rusts on *Bromus* spp. assigned to *Puccinia rubigo-vera* sensu lato [*R.A.M.*, xii, p. 499]. He recognizes two distinct morphologic types of rust on *Bromus*, both of which he assigns to the group-species *P. dispersa*: a brachysporous type with teleutospores squat and broad both above and below, and a dolichosporous type with teleutospores thin and tapering, particularly in the lower cell. He considers it doubtful that *P. glumarum* attacks *Bromus*.

Under *P. dispersa* sensu lato on *Bromus* two geographic groups are recognized: a European group including *P. bromina*, *P. madritensis* (both brachysporous, the former very doubtfully present in North America), *P. bromi-maximi* n. sp., the f. spp. *lithospermi* n. comb. and *symphyti-bromorum* n. comb. of *P. dispersa*, and the f. spp. *bromi-erecti* and *bromi-benekenii* n. f. of *P. alternans*; and a group essentially North American including *P. dispersa* f. sp. *phaceliae*, n. comb., *P. alternans* f. sp. *bromi-porteri*, and *P. bromicola* (Mains) n. comb. with the f. spp. *typica* n. comb., and *arthuri* n. comb. Apart from *P. dispersa* and its forms (in the narrower sense, and with teleutospore shape uncertain), the last-named rusts have dolichosporous teleutospores.

The aecidial hosts and relations of these various rusts on *Bromus* are also considered.

Common fungus diseases.—*J. Dep. Agric. S. Aust.*, lxix, 5, pp. 209–211, 4 figs., 1945; 7, pp. 296–297, 4 figs., 1946.

In the first of these further papers in the present series [*R.A.M.*, xxv, p. 218] notes are given on the symptoms and control of prune rust (*Puccinia pruni-spinosae*) [ibid., xxiii, p. 262] and brown rot (*Sclerotinia fructicola*) [ibid., xxiii, p. 166; xxiv, p. 492] of stone fruits in South Australia. The former is generally present, but regular control is required only where consistent early leaf-drop spoils the ripening fruit, or where peaches invariably show fruit blemish. The fungus appears to overwinter chiefly in pustules remaining on the bark of twigs. Pink-bud Bordeaux spray and sulphur or copper cover sprays are recommended.

The second contribution deals with silver leaf disease [*Stereum purpureum*: ibid., xxiv, p. 153] of stone and pome fruits and apricot gummosis [ibid., xxiv, p. 455]. The latter, very common in non-irrigated areas in South Australia, is due to a fungus [? *Cytosporina* sp.: ibid., xviii, p. 121]; control consists in excising limb infections in summer, disinfecting the wounds with Bordeaux mixture paste, and then painting them with lead base oil paint. Infection may extend from 6 in. to 3 ft. below the gum, so that successive cuts should be made until the sap rises evenly all round the stem. Trunk infections are irremediable. All pruning tools should be frequently disinfected with 5 per cent. formalin. As much summer pruning as possible should be done.

Modlibowska (Irena). **Frost injury to Apples.**—*J. Pomol.*, xxii, 1–2, pp. 46–50, 6 figs., 1946.

Three types of frost injury to apples [*R.A.M.*, xxiii, p. 393] are described, (*a*) loosening of the skin, (*b*) radial splitting of the cortex always accompanied by (*a*), and (*c*) discoloration of the ovules and placenta. The first was the primary and the most common injury but the fruitlets usually recovered in three days. Radial fracturing, which was usually fatal, occurred between the vascular strands and often extended from the subepidermal split to the pith. Recovery from internal discoloration depended not only on its degree and extent but on the nutritional status of the affected fruits, as was shown by the greater recovery in thinned clusters.

Red Victoria was most severely affected by these frost injuries and of the 14 Canadian varieties examined McSweet and Forpear showed most damage and Linda the least, but in no case was the final yield greatly reduced.

Moore (M. H.) & Pearce (S. C.). **The personal factor in routine spraying. I. A preliminary trial on Apple scab.**—*J. Pomol.*, xxii, 1–2, pp. 62–68, 1946.

The considerable variations in the results of spraying for the control of *Venturia inaequalis* [*R.A.M.*, x, p. 37; xv, p. 588], in so far as they are often due to unequal applications of the spray (parts of a tree, particularly large ones, may, for example, escape treatment) led the authors to conduct in 1943 an experiment on 30 trees of bush Bramley's Seedlings of an average height of 15 ft. and spread of 22 ft. and about 30 years old, disposed in six plots of five trees each. Three plots were sprayed (average 4 gals. per tree) in the usual way by a farm hand and three subjected to a most thorough spraying (6 to 7 gals. per tree) by one of the writers. The results, as shown by percentage infection of leaves in June and fruits in September, proved beyond doubt that thorough spraying does reduce variability in scab control. In commercial spraying there is a limit beyond which thorough spraying would be uneconomic, but where the incidence of *V. inaequalis* continues to present a problem in spite of a good spraying programme with an effective fungicide, improvement by more thorough spraying would be profitable. Where good, though incomplete, control is being achieved, it may be as well not to attempt more. Variations in the efficacy of routine spraying by individual workers were brought out by the experiments and it is thought desirable that in experimental work one person should be left to do the spraying and, where more than one is required, the work should be distributed among them so that each is responsible for a block, row, or column.

Palmiter (D. H.). **Ground treatments as an aid in Apple scab control.**—*Bull. N.Y. St. agric. Exp. Sta.* 714, 27 pp., 4 figs., 1 graph, 1 diag., 1946.

These experiments continue and amplify those begun in 1937 [*R.A.M.*, xvi, p. 470] and show that 12 per cent. sodium nitrate or ammonium sulphate or ½ to 1 per cent. elgetol will kill or prevent the discharge of 90 to 100 per cent. of the ascospores of *Venturia inaequalis* in laboratory tests, and reduce the primary inoculum of heavily scabbed orchards sufficiently to make the control of the disease with a wettable sulphur programme [ibid., xxiv, pp. 63, 443] relatively easier. Summer spraying may prove inadequate without such an effective ground spray, thoroughly applied before the green-tip stage. Elgetol at 2 qts. per 100 gals. gave great control of scab in the heavy-rainfall seasons of 1943 and 1945, 500 to 600 gals. spray per acre being required to give adequate coverage. Ground sprays must, however, be regarded as an adjunct of foliage sprayings, and in no wise as a substitute, but the latter may be reduced in concentration and number if ground treatment has been used. Conversely, effective summer spraying which reduces leaf infection to less than 5 per cent. obviates the necessity for subsequent ground treatment.

Wormald (H.). **Pear blossom blight.**—*J. Pomol.*, xxii, 1–2, pp. 41–45, 8 figs., 1946.

A bacterial blight of pear blossom [*R.A.M.*, xi, p. 57; xvi, p. 328], first causing appreciable damage in south-east England in 1929, has frequently recurred during the past 15 years. The incidence of the disease has been most marked when, on the approach of blossom time, there were periods of cold, wet weather. At the same time, in the much drier spring of 1942, when there was little blossom blight, blackened flower trusses, and others which were not discoloured, were covered with a viscous film, by which some buds were sealed up. This attack was considered to result from injuries by the apple blossom weevil [*Anthonomus pomorum*], which are thought to have provided channels for penetration by the blossom-blight infection, inoculation experiments having shown it to be most commonly present where the

outer tissues had been injured. The symptoms varied from black spots or bands on the receptacle, although styles and disk remained normal, to complete blackening round the receptacle and down the pedicel; the peduncle may be blackened and the whole truss withered. Although usually confined to the young tissues of the current year's growth, the disease sometimes invades the older tissues of the spur and on one occasion reached the branches and formed cankers. The most susceptible varieties are Durondeau, Pitmaston Duchess, Marie Louise, and Catillac, although many others suffered severe attacks.

The colonies most frequently obtained (type A) when isolations were made from the bacterial exudate released when the tissues of the blackened parts were squeezed out in water, all exhibited radial lines under miscroscopic observation. Surface colonies of these are raised and almost hemispherical after two or three days, embedded colonies being lenticular and rather dense, and those where the medium rests on the dish, thin and delicate.

Another type of colony (B) had no (or insignificant) radial lines, being minutely granular, almost flat, but sometimes umbonate; and one isolation gave similar colonies having a yellowish tint (C). Inoculation experiments with A, B, and C proved all three to be pathogenic, and type A disclosed characters similar to those of *Pseudomonas prunicola*. Isolates showing similar characters have been obtained not only from infected flowers but also from pear leaf spots and fruit spots which are an unusual symptom of the disease. Inoculations through punctures into pear fruits, either on trees in the field or in a moist chamber, produced in a few days black, slightly sunken, saucer-shaped lesions comparable with those caused by an organism isolated in 1936 from spotted Fertility pears in north Kent, the only other occasion on which bacterial spotting of pear fruits has been seen. Further cultural and inoculation experiments encouraged the conclusion that the A-type pear blossom-blight organism (Group No. 211.2322033) is indistinguishable from *P. prunicola*. The identity of types B and C has not been determined although C may be *P. cerasi*. All three show certain differences from both *P. nectarophilum* and *P. barkeri*. The author adds that eight isolates from pear, five of which were of the A (*prunicola*) type, two of the C type, and one a Lister Institute culture of *P. barkeri*, were submitted by him to Oxford (*Nature, Lond.*, cliv, p. 271, 1943) who included them all under *P. syringae*.

It is thought that these organisms may either overwinter in the dead spurs and be precipitated by rain on to the bursting flower buds, or light on the bud in the development stage, in the spring, and pass the summer and winter there. It is important to remove all infected inflorescences as soon as possible after the presence of the bacteria has been diagnosed because of their prolific multiplication in the tissues; to take measures against insects likely to puncture the flowers and give access to bacteria, and to guard against the accumulation of moisture on the opening buds by keeping the trees open by careful pruning.

Bohn (G. W.) & Maloit (J. C.). **Inoculation experiments with Pseudomonas ribicola.**—*Phytopathology*, xxxv, 12, pp. 1008–1016, 1 fig., 1945.

Ordinary methods of inoculation resulted in scanty infection by *Pseudomonas ribicola* on currant leaves, or alternatively in atypical symptoms. On the other hand, inoculum rubbed with fairly stiff brushes and cotton pads on leaves dusted with 300-mesh carborundum yielded abundant infection of a type comparable to those observed in nature, while intermediate numbers of lesions developed on foliage sprayed with bacterial suspensions after carborundum dusting. It is concluded from these results, in conjunction with field observations in Wyoming, that *P. ribicola* is a wound parasite normally entering currant leaves through the minute injuries inflicted by buffeting against other leaves and branches in the wind, and by driving sand and sleet.

Campacci (C. A.). **A podridão mole do Abacaxi.** [Pineapple soft rot.]—*Biológico*, xii, 3, pp. 70–71, 1946.

Prophylactic measures recommended against soft rot (*Ceratostomella paradoxa*), a troublesome and prevalent disease of the pineapple in São Paulo, Brazil, include care in the collection, transport, and packing of the fruits to avoid bruising and injury; removal from the field after harvesting of rotten debris, also of alternate hosts of the fungus, such as sugar-cane, banana, and mango, to suppress the development of new infection foci; procurement of planting material exclusively from healthy sites; and disinfection of the cut ends of the scapes with a mixture of 25 gm. benzoic acid and 1,000 c.c. 30 per cent. alcohol.

Jenkins (Anna E.). **Historical records of Avocado scab in Florida.**—*Yearb. Calif. Avocado Ass.*, 3 pp., 2 figs., 1939. [Received May, 1946.]

Of four excellent photographs, presented with a brief note, two, taken at the United States Department of Agriculture in 1915, constitute the earliest record of the avocado scab disease (*Sphaceloma perseae*), [*R.A.M.*, xiii, p. 386] and depict diseased Trapp avocado fruit sent by W. J. Krome from Florida in 1915. The two others illustrate the disease on avocado in Florida in 1937. A photograph by Krome showing misshapen leaves and characteristic lesions of avocado scab on a seedling in Cuba in 1916 was too faded for publication. These 1915 and 1916 photographs however, establish beyond doubt the presence of avocado scab disease in Florida and Cuba over 30 years ago.

Cavalli (L.) & Ciferri (R.). **Results of the statistical analysis of six distributions of germination percentages of conidia of Alternaria, tenuis type.**—*Int. Bull. Pl. Prot.*, xix, 11–12, pp. 92M–100M, 1945.

Ciferri (R.) & Cavalli (L.). **Estimation of toxicity by the toxicity curve method according to Prigge and Schaefer.**—Ibid., xx, 1–2, pp. 3M–8M, 1946.

These are English versions of two Italian papers already noticed from another source [*R.A.M.*, xxv, pp. 222–223], the second paper being slightly condensed.

Lugeon (A.). **Action des brassages sur les bouillies anti-parasitaires.** [Action of agitation on anti-parasitic mixtures.]—*Rev. hort. suisse*, xix, 3, pp. 64–65, 1946.

At the instance of a firm of motor-sprayer manufacturers, experiments were conducted at the Laboratory of Chemistry of the Canton of Aargau, Switzerland, to determine the effect of the oxidation produced by agitation with an air pump on the composition of two brands of lime-sulphur, viz., sulfo Maag and schwefyl (1, 2, and 10 per cent.) made up to the requisite quantity of 400 l. with (*a*) tap or spring and (*b*) distilled water.

The following are among the conclusions reached. Precipitates are formed before agitation on the mixture of lime-sulphur with tap or spring water. The limestone in the water combines with the polysulphides of the lime-sulphur to form water-insoluble calcium sulphides, which are independent of the duration of agitation (15 to 90 minutes) or the volume of air (2·1 to 12·5 l.) utilized for this purpose. The use of distilled water resulted in perfectly clear solutions without a trace of precipitate, as also did that of the pure lime-sulphur of commerce. The precipitates are attributable exclusively to the calcium carbonate content of the water. These observations are of considerable practical importance in view of the high limestone content of many springs, notably in the foothills of the Jura, the water from which is unsuitable for the preparation of lime-sulphur mixtures and should be replaced by rain water.

Nickerson (W. J.). **Inhibition of fungus respiration: a metabolic bio-assay method.**—*Science*, N.S., ciii, 2677, pp. 484–486, 1 graph, 1946.

An attempt is shown to provide convenient methods for quantitatively assaying the immediate effect of a chemical on a mycelial organization of a fungus [cf. *R.A.M.*, xviii, p. 753]. *Trichophyton gypseum*, *T. rubrum*, and *Epidermophyton floccosum* were used as test fungi and the influence of several classes of chemicals under different environmental conditions on the oxygen consumption by the fungi was determined by means of the volumetric micro-respirometer described by Scholander and Edwards (*Rev. sci. Instrum.*, xiii, pp. 13, 292, 1942). Mercury, silver, and zinc salts depressed respiration to a comparable extent; cadmium compounds had little effect. *E. floccosum* did not recover after exposure to 1/100 zinc chloride for three hours and clinical trials showed the substance to be of promise in the treatment of tinea cruris and tinea glabrosa. The application of the method is not limited to the dermatophytes.

Gottlieb (S.) & Marsh (P. B.). **Quantitative determination of phenolic fungicides.**—*Industr. Engng Chem.*, Analyt. Ed., xviii, 1, pp. 16–19, 5 graphs, 1946.

The colour reaction of 4-aminoantipyrine with the textile mildew-preventive 2, 2′-methylenebis (4-chlorophenol) in the presence of potassium ferricyanide and dilute sodium carbonate was found adaptable to quantitative analysis for this phenolic substance and has been used for its determination in fabric.

McDonald (J. E.) & Fraps (G. S.). **Commercial insecticides and fungicides in Texas, 1944–1945.**—*Circ. agric. Coll. Tex.* 108, 15 pp., 1945.

This circular provides users of commercial insecticides and fungicides in Texas with information on the State law governing their sale, the analysing of samples for individuals by inspectors of the State Department of Agriculture, the labelling requirements, and the colouring of poisons. A list of and information concerning ingredients claimed to be present is given and the annual publication of analyses required by law is appended.

Ingold (C. T.). **Genetics of the microfungi.**—*Nature, Lond.*, clvii, 3993, pp. 614–616, 1946.

This is a critical review and discussion of some outstanding contributions to the study of genetics in the microfungi, beginning with the discovery of conjugation in a fungus by Ehrenberg in 1818 and referring to a number of important landmarks in the history of the subject between that date and the present time.

Plant diseases. Instructions for collecting and despatching specimens.—*Rhod. J. Agric.*, xliii, 1, pp. 4–5, 1946.

These recommendations to growers wishing to send diseased plants for diagnosis to the Rhodesian Department of Plant Pathology include the desirability of submitting several representative specimens gathered on or the day before dispatch. Advice is given on packing leaves, fruits, and tubers, and on pulling and packing roots, and a specimen form is reproduced whereon full particulars of the plant, its history, and conditions of growth may be designated.

De Urriés y Azara (M. J.). **Un sencillo aparato para aislar esporas.** [A simple apparatus for spore isolation.]—*An. Jard. bot. Madr.*, v, pp. 133–139, 4 diags., 1945.

The author describes a simple method of isolating single spores. The apparatus may be used in two ways. In (A) a needle is attached to the objective of a microscope

and the tip moved into focus. After sterilization the needle is lowered on to a slide bearing spores and a single spore captured on the tip. It is then sown on agar. In (B) a glass rod is affixed to the objective with a needle at its tip which is directed upwards to the under side of the cover slip, whence a spore is detached from the mass and transferred to the medium.

STAKMAN (E. C.) & CHRISTENSEN (C. M.). **Aerobiology in relation to plant disease.**—*Bot. Rev.*, xii, 4, pp. 205–253, 1946.

This paper, which includes a bibliography of 151 titles [cf. *R.A.M.*, xxiii, p. 139], discusses the adaptation of fungi to aerial dissemination, [ibid., xxiv, p. 378], the quantities of spores and devices that facilitate their production and release, spore wastage, size in relation to altitudes reached by spores, their rate of fall [ibid., xxiii, p. 310], theoretical dispersal distance, local and long-distance dissemination, and longevity. In relation to the two last-named, rusts of oats (*Puccinia coronata* and *P. graminis*) and leaf [brown] (*P. triticina*) and stem [black] (*P. graminis*) rusts of wheat in the United States, and cereal rusts in Europe, North Africa, and India are treated in detail. The paper concludes with a discussion on the range of the projection of viable spores by wind, and the dissemination of physiologic races of *P. graminis* in the United States and Mexico.

TRINCHIERI (G.). **Air transport and phytosanitary control.**—*Int. Bull. Pl. Prot.*, 1–2, pp. 1–16, 1945.

The notable advance in air transport all over the world has made increasingly imperative an international plant quarantine service. In this paper, written before the war had come to an end, the dangers from the dissemination of disease organisms carried by air-borne transport and actual records of such transference are clearly set out, based largely on official sources of the United States quarantine service. A staff of plane inspectors who will make full records of organisms found, the results of which should be fully publicized, is suggested. Insecticidal mixtures for spraying aeroplanes are reviewed, but no specific fungicidal agent is given, although disinfection with those of recognized efficacy is recommended.

JOHNSON (M. J.), STEFANIAK (J. J.), GAILEY (F. B.), & OLSON (B .H.). **Penicillin production by a superior strain of mold.**—*Science*, N.S., ciii, 2678, pp. 504–505, 1946.

Yields of penicillin greatly exceeding those produced by *Penicillium chrysogenum* No. 1951-B25 were obtained from an X-ray mutant of this culture designated X-1612 [see next abstract]. The maximum yield of the mutant amounted to 557 units per ml. compared with 245 for the parent.

KOFFLER (H.), KNIGHT (S. G.), FRAZIER (W. C.), & BURRIS (R. H.). **Metabolic changes in submerged penicillin fermentations on synthetic media.**—*J. Bact.*, li, 2, pp. 305–316, 2 graphs, 1946.

The addition of the ash from maize steep (3 per cent.) to a medium consisting of lactose, dextrin, and mineral salts caused a remarkable increase in penicillin yields in shake-flask fermentations [*R.A.M.*, xxv, p. 130 and next abstracts], which was further enhanced by the incorporation of 0·05 per cent. phenylacetamide. A slight stimulus to penicillin production may also be given by 0·13 per cent. boric acid. Moreover, *Penicillium chrysogenum* X-1612 [see preceding abstract] on maize steep media utilized sugars and ammonia more rapidly than did the controls without this supplement.

MOYER (A. J.) & COGHILL (R. D.). **Penicillin. VIII. Production of penicillin in surface cultures. IX. The laboratory scale production of penicillin in submerged cultures by Penicillium notatum Westling (NRRL 832).**—*J. Bact.*, li, 1, pp. 57–93, 1 graph, 1946.

Several culture methods can be utilized for the inducement of sporulation by *Penicillium notatum* for the inoculation of production cultures [cf. *R.A.M.*, xxv, p. 130]. The spores grow readily on agar slants or plates, while the use of dry material, mixed with a floating or spreading agent, e.g., whole-wheat flour, has given very satisfactory results in respect of uniformity of surface growth and penicillin yield.

None of the *P.* spp. so far tested for penicillin production in surface culture has proved superior to one of the descendants of the original Fleming strain (NRRL 1249. B21), freed as far as possible from degenerate mutants, and which is now widely used in industry. The yield of penicillin produced in surface cultures by *P. notatum* has been increased from between 2 and 6 to over 200 units per ml. Production is greatly stimulated by the addition to the medium of maize steep liquor (0·5 per cent.) [see preceding abstract], while lactose or starch were found to be more favourable to penicillin development than glucose, sucrose, sorbitol, or glycerol. Yields of 190 units per ml. have been secured in five days by the use of NRRL 1249. B21 in a medium containing maize steep liquor and lactose, with a further increase up to 220 units per ml. from the addition of nutrients during the course of fermentation (0·20 gm. each lactose and glucose, 0·010 gm. maize starch, and 0·050 gm. maize steep liquor per ml. daily from the fourth day). Penicillin yields of 112 units per ml. have been obtained in six days by the use of a pre-germinated ('pellet') inoculum, prepared by developing mycelium from spores, in submerged culture, in a medium containing, besides the standard nutrient salts, 30 gm. lactose and 55 ml. maize steep liquor per l. After two to three days on the Ross-Kershaw shaker, the 'pellets' were 0·5 to 1 mm. in diameter and the solution had a penicillin content of 8 to 10 units per ml. and a P_H of 7·6 to 7·8.

WHALLEY (MURIEL E.). **Abstracts on penicillin and other antibiotic substances.**—166+19 pp., Ottawa, National Research Council of Canada, 1945. $1.00. [Mimeographed.]

This is a second edition, revised and supplemented, of abstracts taken from various sources from 1917 to 1944 [*R.A.M.*, xxiv, p. 27].

BRIAN (P. W.), CURTIS (P. J.), GROVE (J. F.), HEMMING (H. G.), & MCGOWAN (J. C.). **Gladiolic acid; an antifungal and antibacterial metabolic product of Penicillium gladioli McCull. and Thom.**—*Nature, Lond.*, clvii, 3995, pp. 697–698, 1946.

The authors report the isolation of a substance named gladiolic acid from culture filtrates of *Penicillium gladioli* [*R.A.M.*, vii, p. 448], yields as high as 300 mgm. per l. having been obtained. Gladiolic acid inhibited the growth of *Staphylococcus aureus* at P_H7 at 250 μgm. per ml., but was much more markedly fungistatic, a concentration of 2 μgm. per ml. at P_H 3·5 preventing the germination of *Botrytis allii* conidia, whereas at P_H7 a concentration of 100 μgm. per ml. was required.

LE PAGE (G. A.) & CAMPBELL (ELIZABETH). **Preparation of streptomycin.**—*J. biol. Chem.*, clxii, 1, pp. 163–171, 1 graph, 1946.

A relatively simple procedure for the production of streptomycin [*R.A.M.*, xxv, p. 308] in surface cultures on a yeast extract medium fortified with minerals is described, and a new method for the purification of the antibiotics thus obtained is outlined. The resultant products have a potency of 350 to 450 S units per mg.

Diller (Violet M.), Tytell (A. A.), & Kersten (H.). **Mutation of Aspergillus niger Van Tieghem by means of X-rays.**—Abs. in *J. Bact.*, li, 3, p. 404, 1946.

A mutant of *Aspergillus niger*, differing from the original culture in appearance and growth habit, was induced by irradiation with soft X-rays. At the peak of production the mutant yielded 50 per cent. more citric acid, with a lower sugar consumption, than the parent.

Arragon (G.), Mainil (J.), Refait (R.), & Velu (H.). **La flavinogénèse par Eremothecium ashbyii, Guilliermond. Étude du facteur surface/volume.** [Flavinogenesis by *Eremothecium ashbyii*, Guilliermond. Study of the surface/volume factor.]—*Ann. Inst. Pasteur*, lxxii, 3 4, pp. 300–305, 4 graphs, 1946.

Riboflavin (vitamin B_2) production by *Eremothecium ashbyii* [*R.A.M.*, xxv, p. 213] was three or four times more abundant in surface cultures on solid or semi-solid media than in those immersed in liquids (343, 321 to 360, and 426 mg. per mille, respectively, on 5, 10, and 15 per mille agar compared with 107 in bouillon). The yields reached a peak on the ninth to tenth day in the solid series and on the 15th in the liquid.

Stewart (F.), Scalf (R. E.), & Stark (W. H.). **Submerged culture of moulds for amylase production.** Abs. in *J. Bact.*, li, 3, pp. 401–402, 1946.

The use of surface mould cultures for amylase production is normally attended by a serious drawback in the form of bacterial contamination. This has been obviated at the plant of Joseph E. Seagram & Sons, Inc., Louisville, Kentucky, by the development of a submerged culture technique specially adaptable for use in the conversion of grain mashes in a continuous fermentation process [cf. *R.A.M.*, xxv, p. 306]. The amyloclastic and saccharogenic values of the amylases were increased from 300 and 600, respectively, by the selection of 21 species of *Aspergillus*, *Mucor*, *Penicillium*, and *Rhizopus* and their growth under optimum conditions of medium, hydrogen-ion concentration, and aeration.

Whalley (Muriel E.). **Abstracts on fungi and bacteria affecting various materials.** —228 pp., Ottawa, National Research Council of Canada, 1944. $1.50. [Mimeographed.]

These 449 abstracts on fungi and bacteria affecting textiles, leather, rubber, silk, paper, and pulp have been taken from *Chem. Abstr.*, 1907 to 1943 inclusive, and from *J. Text. Inst., Manchr*, 1910 to 1943 inclusive.

Lavers (C. G.) & Illman (W. I.). **Packaging. III. Effect of mould growth and ageing on the water-vapour transmission of packaging materials.** -*Canad. J. Res.*, Sect. F, xxiv, 2, pp. 117–122, 20 graphs, 1946.

In this experiment packaging materials (*Canad. J. Res.*, Sect. F, xxiii, pp. 109–116, 1945) were dusted with spores of *Syncephalastrum racemosum*, *Paecilomyces varioti*, *Penicillium* spp., *Aspergillus niger*, *A. flavus*, *A. terreus*, *Chaetomium globosum*, and *Stachybotrys atra*, and stored at 95° F. and 95 to 100 per cent. humidity for one to five weeks. M.S.T. and M.S.A.T. cellophane suffered only light mould damage, whereas M.S.Y.T. cellophane had considerable mould growth. The heat-sealing, moisture-proof lacquer deteriorated during storage in conditions favouring optimum development of the moulds. Wax-coated materials tolerated prolific mould growth and when wax peeled from the surface of the sheet their water-vapour transmission values increased. Laminated materials having metal foil as one layer suffered little by mould growth as regards their transmission rate or by the delamination of the other layers. Most samples of kraft and glassine acquired abundant mould growth. Cellulose acetate, pliofilm [ibid., xxiii, p. 290], and vinyl-film showed negligible mould.

Bayley (C. H.) & Weatherburn (Muriel W.). **The effect of weathering on Cotton fabric containing certain copper rotproofers.**—*Canad. J. Res.*, Sect. F, xxiv, 3, pp. 193–202, 1946.

Samples of No. 8 cotton duck exposed to outdoor weathering from mid-July to mid-October, 1944, showed substantial losses in breaking strength, which were of the same order in untreated material and that impregnated with copper naphthenate [*R.A.M.*, xxiv, p. 380], copper hydroxynaphthenate, copper oleate, and copper tallate containing 0·1 to 1 per cent. copper. The treated samples showed slight evidence of increased actinic degradation from the action of the sun's rays as measured by cuprammonium fluidity. Weathering was responsible for a considerable reduction in the copper content of the treated specimens. The addition to the rot-proofer of a waterproofing compound of the wax pigment filler type helped to maintain the copper content of the exposed samples at a reasonably high level, to minimize the loss in breaking strength, and to inhibit fungal infection in soil-burial tests. The initial water resistance of the proofing was impaired by all the copper compounds except the hydroxynaphthenate, which enhanced it. It is noted that breaking-strength losses are much less in buried samples that have been previously exposed to weathering than those which have not. [This information is also presented in *Amer. Dyestf. Reptr*, xxxv, 9, pp. 218, 235-236, 1946.]

Björkman (E.). **Om skogsplanteringens markbiologiska förutsättningar.** [On the prerequisite edaphic conditions for forest planting.] –*Svenska Skogsvårdsfören. Tidskr.*, xlii, 5, pp. 333–355, 13 figs., 1944. [English summary. Received April, 1946.]

Mycorrhizal relationships appear to be an important factor in the establishment of forest plantations in northern Sweden [*R.A.M.*, xxiv, p. 465], and insufficient attention to this factor may well account for the failure of many attempts in this direction. On mediocre and relatively poor soils forest trees normally absorb their nutriment through the assistance of their mycorrhizal symbionts, whereas in a richer soil, with few mycorrhiza, root hairs or roots converted into pseudomycorrhiza may serve the same purpose.

The slow growth rate of many spruces up to the age of 10 or 20 years, associated with mycorrhizal paucity, constitutes a special problem. This species has been found to be less prone to the development of mycorrhiza than Scots pine (*Pinus sylvestris*) and more especially *P. montana*. In conformity with similar experiments in various countries not previously afforested with conifers, e.g., Western Australia, Sumatra, South America, and the North American prairies, mycorrhiza-bearing pine seedlings planted in sterile peat with a low phosphorus content grew in the course of one summer to double the size of the mycorrhiza-free controls [ibid., xvi, p. 126]. It may be concluded from these observations that plants supplied with mycorrhiza are more readily able to utilize small amounts of phosphorus in the soil than are those deprived of symbionts.

The transplanting of trees from one environment to another involves a strain on the nutritional balance of the roots, which require special treatment to fit them for their new surroundings. Thus, seedlings intended for transference to a poor soil should be given little or no fertilizer so that mycorrhiza may be formed in profusion, whereas on rich sites heavily manured plants, even without mycorrhiza, may be used. It is recommended that nurseries should be located on the same soil as that on which the seedlings are ultimately to be planted out. Plants from poor forest soil should not be transferred to manured gardens.

Reed (G. M.). **Physiologic specialization of the parasitic fungi. II.**—*Bot. Rev.*, xii, 3, pp. 141–164, 1946.

Investigations of physiologic specialization in plant pathogens, particularly

those of cereals, and to a lesser extent those of other economic plants, are reviewed over the ten years which have elapsed since the author published his first paper on this subject [*R.A.M.*, xiv, p. 648]. The additions, which have since taken place, to the physiologic races of the various fungi, together with some morphological distinctions discerned, and their geographical distribution, are mentioned, and racial tables of the cereal and other rusts, the cereal smuts, the powdery mildews, and other pathogens, together with a bibliography of 177 titles, are supplied.

Stapp (C.) & Marcus (O.). **Beiträge zur weiteren Vereinfachung der serologischen Virusdiagnose.** [Contributions to the further simplification of the serological virus diagnosis.]—*Zbl. Bakt.*, Abt. 2, cvi, 20–24, pp. 465–471, 1 fig., 1 diag., 1944. [Received May, 1946.]

Twelve successful experiments in the conservation of valuable serum for virus diagnosis are described. After a preliminary treatment for the elimination of antibodies against healthy plant protein by the addition of uninfected tobacco or potato leaf extract and subsequent withdrawal by centrifugation of the precipitate thus formed, the antisera against potato viruses X, Y, and A [see above, p. 322] were dried on blotting-paper or cellulose and cut into small pieces 0·09 to 0·125 sq. cm. in area; these were introduced into the expressed plant juices to be tested on slides in place of the liquid sera. The desiccated sera were found to maintain their activity for periods of up to a year. The most effective method consisted in drying on long-fibred cellulose and conservation in the desiccator over calcium chloride. Precipitation was admittedly one degree weaker than in the controls with liquid serum, but the saving effected by the treatment is substantial, only one-tenth of the serum quantity ordinarily required being requisite.

Lutman (B. F.). **Actinomycetes in various parts of the Potato and other plants.**—*Bull. Vt agric. Exp. Sta.* 522, 72 pp., 35 figs., 1945.

The results of the author's histological investigations [cf. *R.A.M.*, xxi, p. 38] to determine the filamentous nature of the irregular lines resembling cell walls observed microscopically in sections of potato confirmed his view, in the light of the known occurrence of Actinomycetes in the outer layers of roots and tubers, and of the morphological resemblance of these filaments to *Actinomyces* strands and their protein nature, that they represent *Actinomyces* mycelium. Their abundance in the external layers of potato tubers and roots and in the aerial stems, their presence in leaves along the phloem of the veins and generally in the flowers and seedlings seemed to indicate a phenomenon of systemic and hereditary nature. Their invasion of the intercellular spaces of the abcission swelling at the outer margin of a swollen area on the pedicel invites the conclusion that an *Actinomyces* sp. might precipitate blossom-drop under stimulus such as undue heat by premature disintegration of the intercellular pectins. Their rapid penetration of regenerated cork cambium cells, their association with scab (*A. scabies*) lesions and extension from the abnormal cells of the cork cambium to the heart of the tuber, and their presence in clean tubers from clean land, demonstrate their universal occurrence. Similar Gram-positive filaments are present in the cell walls of Jerusalem artichoke [*Helianthus tuberosus*] tubers and enlarged roots of beets, carrots, parsnips, and turnips. It is also suggested that leaf roll, the foliage stage of tuber net necrosis, is due to the effect of these filaments.

Jackson (A. W.) & Henry (A. W.). **Occurrence of Bacillus polymyxa (Praz.) Mig. in Alberta soils with special reference to its pathogenicity on Potato tubers.**—*Canad. J. Res.*, Sect. C, xxiv, pp. 39–46, 2 pl., 1946.

Bacillus polymyxa, isolated from a variety of soils, is presumed to be a widely distributed soil organism in Alberta. The 20 isolates and other strains from culture

collections all caused rotting of potato tubers and slices [*R.A.M.*, xxii, p. 493], when introduced through wounds, under conditions of abundant moisture and high temperature (up to 45° C. but not below 30° for the tubers or 20° for the slices). Consequently, in spite of its wide distribution, it is not anticipated that it will be a serious cause of rotting in the field, since soil temperatures in Alberta are too low (occasionally those near the soil surface may reach favourable levels), but it may be of more importance under storage conditions, especially in conjunction with other organisms. *B. polymyxa* was isolated several times from rotted tubers but it was never the sole causal organism of the rotting. When freshly cut tubers were buried in moistened Edmonton soils in pots at 20° to 25° they became infected after four to six days, usually in combination with other bacteria and fungi. At recommended storage temperatures no damage from the organism should occur.

WHITEHEAD (T.), McINTOSH (T. P.), & FINDLAY (W. M.). **The Potato in health and disease.**—Second edition—xv+400 pp., 11 pl., 13 figs., 2 diags., Edinburgh & London, Oliver & Boyd, 1945. 25*s*.

Chapters XII to XX of this manual deal with potato diseases arranged under the systematic groups of the causal organisms. The introductory chapter (XII) gives a two-page key for the identification of the diseases and disorders, and a table showing the systematic relationships of the causal organisms. Each disease is treated fully under the following headings: general appearance (with photographs), symptoms of other diseases with which it might be confused, distribution, description of the causal organisms, losses, and control. A chapter is given to diseases and conditions of uncertain origin, while virus diseases are treated in three chapters under the headings mentioned above and with special reference to the deterioration and degeneration of potato stocks. The spread of viruses and their identification are treated fully: the reactions of common potato varieties to them are tabulated in the appendix. The latter also gives fungicidal treatments of growing plants and tubers, and descriptions of 53 varieties in which are included remarks on their reactions to diseases. Bibliographical references to the phytopathological sections are given.

BALDACCI (E.). **The presence in Italy of Fusarium moniliforme on Rice and its phytopathological signification.**—*Int. Bull. Pl. Prot.*, xx, 1–2, pp. 1M–2M, 1946.

With reference to the report by Elisei of *Fusarium moniliforme* (*Gibberella fujikuroi*) [*R.A.M.*, xviii, p. 54] on rice in Italy, the author states that the fungus was also reported on the same host in Italy by Cattaneo in 1877 under the name *F. heterosporum*. The disorders attributed to the fungus in Italy take the form of collar rot only. Locally, only 1 per cent. of the rice plants are attacked. Experimental infections indicated that the Italian strains are of average pathogenicity. The optimum temperature for infection was ascertained to be 35° C., a figure only very rarely reached in the rice-growing areas of Vercelli and Pavia. The climatic conditions in Italy also do not favour infection in other respects. There was no difference in morphological characters between the Italian and tropical strains. The perfect state (*G. fujikuroi*) was not found in Italy, but in culture on agar-agar perithecial rudiments were observed once.

It is concluded that the pathogenic activity of the organism depends on special climatic and cultural conditions not so far found in Italy.

CAMPBELL (W. A.) & SLEETH (B.). **Variability of Pythium ultimum from Guayule.**—*Mycologia*, xxxviii, 1, pp. 24–39, 2 figs., 1946.

The failure of 24 out of 51 isolates, during studies of the root rot disease of guayule (*Parthenium argentatum*) caused by *Pythium ultimum* [*R.A.M.*, xxv, p. 43], to produce the oogonia and antheridia required for their reference to this genus has

led the authors to investigate the variability in spore formation of 121 *P. ultimum* isolates.

Of those grown on maize-meal agar, three were classified as type O on the ground of their producing chiefly oospores; 71, producing oospores and more or less sporangia, were classed as type OS; and 47, producing only sporangia, as type S. Subcultures from 3 O, 11 OS, and 7 S types proved similar to the parent cultures; 4 OS type isolates segregated for types O and S, respectively, and two for types OS and S, suggesting that these four isolates were mixed cultures or unstable as to type.

Attempts on various media to produce oospores on S type isolates failed. Rates of growth on maize-meal agar at temperatures ranging from 10° to 40° C. were similar for 5 O, 13 OS, and 11 S types of hyphal-tip subcultures of 25 isolates and corresponded to those previously recorded for *P. ultimum* [ibid., xxii, p. 373], a temperature between 25° and 30° being optimal for mycelial growth. Twenty-six subcultures including all three types developed much the same degree of virulence as pathogens causing pre-emergence loss in guayule seedlings. While most hyphal-tip or single-spore subcultures proved stable, successive hyphal-tip transfers of a hyphal-tip subculture of one isolate, 980, of the OS type, produced both the O and S types as well as the parent type.

It is concluded, therefore, that the species *P. ultimum* represents a number of strains diverging in their ability to generate either oospores, or sporangia, or both, the production of oospores and sporangia by a particular strain being roughly constant and likely to persist indefinitely on hyphal-tip or single-spore transfers. It is suggested that the homothallic nature [ibid., xviii, p. 472] of the fungus and the absence of anastomoses in the mycelium offers an explanation of this stability in many strains of *P. ultimum*. Where variation occurs, as in the case of the oospore-sporangia type, notably those from isolate 980, it is suggested that variation may result from gene mutation or somatic segregation, inducing a heterocaryotic condition [ibid., xviii, p. 497; xxii, pp. 250, 538].

Staner (P.). **Les maladies de l'Hévéa au Congo belge.** [*Hevea* diseases in the Belgian Congo.]—*Mém. Inst. roy. colon. belge*, xi, 6, 42 pp., 6 figs., 1941. [Received June, 1946.]

The author summarizes the available information on the following pathogens affecting *Hevea* rubber and their control in the Belgian Congo [*R.A.M.*, xi, p. 2]: agents of root rots, *Fomes lignosus* [ibid., xii, p. 80]; *Ganoderma pseudoferreum*, *F. noxius*, *Ustulina zonata*, and *Sphaerostilbe repens*; stem diseases, brown bast and *Phytophthora palmivora* cankers; branch rots caused by *Corticium salmonicolor* and *U. zonata*; leaf infections associated with *Oidium heveae*, *Helminthosporium heveae*, and *Ascochyta heveae*; and moulds on the smoked sheets [ibid., xviii, p. 272 *et passim*].

Weindling (R.). **Microbial antagonism and disease control.**—*Soil Sci.*, lxi, 1, pp. 23–30, 1946.

The two experimental approaches at present used to investigate possible improvements in microbial control of soil plant pathogens are recalled, viz., inoculation of soils with specific organisms and the provision of soil amendments favouring the antibiotic functions of the existing microflora. The second is the only one widely and successfully used.

The principles underlying biological control put forward by Thompson (*Parasitology*, xxi, pp. 269–281, 1929) as a result of entomological studies are found to serve for plants and are discussed in that light.

The means of control of two soil invaders, *Ophiobolus graminis*, which does not form special perennating bodies, and *Phymatotrichum omnivorum*, which produces resistant sclerotia, are contrasted. The former is eradicated fairly rapidly by

organic amendments [*R.A.M.*, xviii, p. 476; xxii, p. 129], the precise nature and action of which are still under debate. The latter is reduced by long, continuous treatment with organic materials, with or without deep ploughing, the micro-organisms destroying the germinating sclerotia. The application of the organic material must be timed for the right period of crop development and climatic conditions to give maximum microbial activity at the crucial point.

The assessment of the complex, ever-changing, microbial influence is difficult. Attempts at analysis of the mechanism serve as a useful pointer to a promising approach to an understanding by the setting-up of soil microbiological indicators comparable to the phyto-indicators used in plant ecology.

WALKER (J. C.). **Soil management and plant nutrition in relation to disease development.**—*Soil Sci.*, lxi, 1, pp. 47–54, 1946.

The influence of plant nutrition on the course of disease development should, in the author's submission, be made the subject of more intensive investigation both in nutrient culture and in the field.

Fusarium wilt pathogens are selected for review because of their similarity in mode of entry, effect on the plant, in their capacity to persist as free-living fungi in competition with other soil organisms, and in their selective pathogenicity. The fungistatic effect of potassium amendments [*R.A.M.*, xxi, p. 438] in the control of *F. oxysporum* var. *melonis* and the even more interesting reduction of cotton wilt (*F. oxysporum* var. *vasinfectum*) [*F. vasinfectum*] by the use of potassium salts, are cited. Further research by M. N. Walker [ibid., x, p. 241], Miles (*Bull. Mo. agric. Exp. Sta.* 23), and others illustrated the necessity of combining resistance with fertilizer treatments if successful control was to be achieved on heavily infected soil. The author's studies [*R.A.M.*, xxiv, p. 484] on *F. oxysporum* var. *conglutinans* [*F. conglutinans*], causing cabbage yellows, also indicated that inherent host resistance was the limiting factor and that host nutrition and temperature exerted their effects only when resistance was partial or lacking. In the case of tomato wilt (*F. oxysporum* [*F. bulbigenum*] var. *lycopersici*) variation in nutrient concentration and ion balance gave similar results as for cabbage yellows.

A comparison between two diseases of cabbage yellows and club root (*Plasmodiophora brassicae*) [ibid., xx, p. 147] demonstrated that an increase in salt concentration of the nutrient solution depressed yellows development, while that of club root was increased. Reduction of the potassium-ion concentration increased yellows but decreased club root. Reduction of the nitrate ion decreased yellows, but club root increased whether the nitrate ion was increased or decreased, and reduction of the phosphate-ion concentration acted fungistatically on both.

The control of *Actinomyces scabies* by high soil acidity is attributed to the fungistatic effect of the H-ion upon the scab organism. The work of Schroeder and Albrecht [ibid., xxi, p. 469] and Gries *et al.* (abs. in *Phytopathology*, xxxiv, p. 1001) points to the probable influence of the P_H in modifying the calcium-ion concentration in the soil and so altering the calcium : potassium ratio. The same may be true for club root.

Eddins's success in the course of his studies of bacterial wilt of potatoes, tomatoes, and eggplant (*Bacterium* [*Xanthomonas*] *solanacearum*) [*R.A.M.*, xv, p. 459] in increasing by 10 to 15 times the yield of eggplant and tomato crops in Florida in 1935 by adjusting the P_H by sulphur treatment followed by liming is described.

Failure of conventional liming methods to control *Plasmodiophora brassicae* in the field, although the P_H was raised thereby above 7, caused Larson and Walker [ibid., xiii, p. 669] to remove the soil to a greenhouse where, under uniformly favourable conditions of soil moisture, the pathogen was inhibited entirely. It is thought that under field conditions the lowering of the P_H of the solution immediately surrounding the roots by the release of carbon dioxide rendered the

germination of *P. brassicae* possible in spite of the high P_H level in the soil mass. The author suggests that the same might hold for potato scab.

The wide discrepancies often occurring between results in different areas suggest that large-scale soil management may fail unless based on studies of host nutrition.

JOHNSON (J.). **Soil-steaming for disease control.**—*Soil Sci.*, lxi, 1, pp. 83–91, 1946.

Soil-steaming for the elimination of pests and pathogens is followed by bad results as well as good for, while plant parasites, weed seeds, etc., may be eliminated, normal and desirable soil flora and fauna may be destroyed also; an immediate chemical action is set up by soil-steaming, which causes the partial decomposition of certain organic and inorganic materials and the formation of phytocidal substances, such as ammonia, apart from the release of materials which encourage plant growth. Biochemical, physical, and physiological changes bring about, respectively, modified ammonification, nitrification, nitrogen fixation, and denitrification; modified absorptive capacity of the soil for water, gases, and salts; and alteration in the development of lower soil organisms, in seed germination, and plant growth. Numerous examples are cited where recontamination of steam-heated soils has been heavy and the infection of subsequent crops has been much higher than in unheated soil.

GARRETT (S. D.). **Soil as a medium for transfer and multiplication of disease organisms.**—*Soil Sci.*, lxi, 1, pp. 3–8, 1946.

In this review the author, after noting the preoccupation of early workers exclusively with host-parasite relationships, traces the development of soil research, in particular that on micro-organisms, in relation to diseases up to the environmental researches of Thom and Morrow [*R.A.M.*, xvi, p. 407], whose division of soil fungi into those able to live normally in relation to soil organic matter in the chemical sense, i.e., to residual products of decomposition, and those responsible for the primary decomposition of plant and animal remains towards those residual products, is considered to have opened up an horizon full of interest for further investigations. Waksman's [ibid., xi, p. 470] and Reinking and Mann's [ibid., xiii, p. 593] work led the present author to designate as soil-invaders highly specialized parasites which die out in the soil in the absence of a host plant because they cannot compete with the soil inhabitants or saprophytes for an existence on inanimate organic matter; and to envisage a spatial and a temporal distribution of a given soil micro-organism on organic substrata [ibid., xvii, p. 625]. By 1944 Garrett had come to see the development of the root-infecting fungi as a means of escape from the bitter competition for saprophytic existence in the soil [ibid., xxiv, p. 199] and he considers them entitled to take a place analogous to that of specialized higher plant groups which have the capacity to populate inhospitable habitats. Decomposition must also be accompanied by changes in the microflora causing it, so that there is a progressive micro-organic development on these organic substrata which parallels colonization on the ground above. Surface vegetations, however, compete for space and light, whereas the subterranean succession is conditioned by the struggle for the exhaustible, and therefore, finite, substrata. The highly specialized parasite, *Ophiobolus graminis*, an example of a soil-invader, is limited to the Graminaceous hosts on which alone it can spread and multiply; and its temporal distribution is restricted saprophytically to the uncertain habitat of plant tissues it has parasitically occupied. In contrast *Fusarium culmorum* is a primitive parasite following *O. graminis* as a secondary pathogen and also colonizing healthy wheat roots and straw remaining in the soil after harvest [ibid., xix, p. 10; xxi, p. 134]. The *Rosellinia* fungi are similarly regarded as primitive parasites classed as soil inhabitants, their nutrition being predominantly saprophytic.

DAINES (R. H.). **Control of plant diseases by use of inorganic soil amendments.**—*Soil Sci.*, lxi, 1, pp. 55–66, 1946.

The results [taken from 37 sources] of experiments, in which inorganic substances have been used in attempts to control soil diseases, are reviewed. Sulphur and liming materials, which act indirectly by altering the P_H, have given very conflicting results for *Actinomyces scabies* and *Plasmodiophora brassicae*, respectively. This seems to arise from complex soil reactions not at present known or understood.

Copper and mercury act directly as fungicides. Here again great variability in toxicity is encountered which may be attributed to various causes. In the case of copper it may be due to (1) soil acidity which may alter the solubility of the copper, (2) the adsorptive power of the soil constituents, (3) the presence of proteins and their decomposition products which release toxic copper but themselves depress the toxicity, or (4) the presence of calcium, magnesium, or potassium chlorides which also depress the toxicity.

The variability of mercurial action in the case of *A. scabies* is attributed to the difference in tolerance of mercury exhibited by different strains of the parasite. In other cases it is believed to be due to the ability of the soil to retain the mercury whether by virtue of its own composition or the treatments to which it is subjected.

NEWHALL (A. G.). **Volatile soil fumigants for plant disease control.** *Soil Sci.*, lxi, 1, pp. 67–82, 3 figs., 1946.

The value of a cheap volatile soil fumigant for the purpose of controlling a number of plant pathogens capable of persisting in the soil for many years has long been recognized; but one or other or more of the qualities desired for an ideal fumigant of this kind are still lacking, namely, cheapness, non-inflammability, easy handling, and harmlessness to operators and equipment. Stark (Investigations relevant to the use of chloropicrin for soil fumigation, Thesis, Cornell University, 1945), using a specially devised gas-tight chamber designed to test the amount of chloropicrin gas adsorbed into the soil, showed that the clay fraction was largely the determining factor of the amount of gas adsorbable by any soil. The process was less pronounced at higher humidities, but did not appear influenced by accumulation of soil particles, P_H changes, or organic matter, present as dry muck, peat, or horse manure.

The soil fumigants in common use, viz., chloropicrin, carbon disulphide, DD mixture (a petroleum by-product with rather limited fungicidal properties), ethylene dichloride (not a good fungicide), methyl bromide (shown by the author to be capable of killing sclerotia of *Sclerotinia sclerotiorum*) and its proprietary modification dowfume G (10 per cent. methyl bromide), are reviewed and compared as regards harmfulness, costs, mode of employment, retention by the soil, and their efficacy against nematodes, weeds, and fungi. This information, together with other relevant data for these and lesser known fumigants, is summarized in a table. None of these is as effective as steam, but those which are nearly so are considerably less costly.

The paper concludes with an illustrated description of devices for applying volatile soil fumigants.

BEACH (W. S.). **Pathogenic and physiogenic damping-off.**—*Soil Sci.*, lxi, 1, pp. 37–46, 1 fig., 1946.

A list is given of the plants more usually affected by damping-off and the symptomatology of the more important pathogens is shortly described. The environmental factors influencing pathogenic damping-off, viz., temperature, light, moisture, P_H, humus, and salt concentration are reviewed. From these it appears that although *Pythium*, *Rhizoctonia* [*Corticium solani*], and *Fusarium* have similar temperature ranges and optima the first-named is more prevalent in colder months

and the two latter in the summer. Soil moisture is considered to be the major factor in the causes of damping-off. If, however, soil is air-dried before use good stands are obtained even in moist soils. Damping-off pathogens are adapted to a wide P_H range, but if the plant is growing in a soil at its P_H optimum, it is able to resist or escape attack. Soil sterilization by reducing microbial competition increases the liability of plants to attack by these pathogens, which as facultative parasites benefit by the humus made available. The methods of control of damping-off are given and it is suggested that the most efficient control is obtained by combined seed-dressing, soil sterilization, and seed-bed drenches. Sand culture and the use of shredded sphagnum moss are recommended. Physiogenic damping-off may be caused by high temperatures, soil drying, excess salt concentration, and exosmosis induced by these, or conversely by waterlogging, bad aeration, or chilling. The type of injury resulting from these is often difficult to dissociate and distinguish from that due to parasites.

Nicholas (D. J. D.). **Detection of manganese deficiency in plants by tissue tests, using tetramethyl diaminodiphenyl methane.**—*Nature, Lond.*, clvii, 3995, p. 696, 1946.

The detection of manganese deficiency [*R.A.M.*, xxv, p. 15] by the tissue test method (associated originally with the work of Wenger and Duckert, *Helv. chim. Acta*, xxiv, p. 1143, 1941, and Szebelledy and Bartfay, *Z. anal. Chem.*, cvi, p. 408, 1936), using tetramethyldiaminodiphenylmethane, which induces a blue colour in proportion to the manganese content of the extract of the tissues, is briefly described and is expected to be the subject of a fuller report. Acetone has been found more reliable than chloroform (recommended in the original publications) as a solvent for the reagent.

Roach (W. A.) & Barclay (C.). **Nickel and multiple trace element deficiencies in agricultural crops.**—*Nature, Lond.*, clvii, 3995, p. 696, 1946.

Increases in yield of wheat, potatoes, and broad bean crops are recorded by the authors in field experiments on the Romney Marshes in 1944 following spraying with solutions containing manganese, iron, boron, copper, zinc, and nickel, the increases being statistically significant and economically important with the possible exception of copper and zinc on wheat. This is thought to be the first record for Britain of a successful contribution by nickel to better crop yields and the first occasion of zinc deficiency in Britain being proved by the increase in yield as result of treatment with zinc. In experiments on potatoes showing severe symptoms of manganese deficiency applications of manganese strikingly improved the foliage without any effect on yield, zinc sulphate alone raised the yield 27 cwt. per acre, and both manganese and zinc increased the yield 78 cwt. per acre.

Riceman (D. S.). **Mineral deficiency in plants on the soils of the Ninety-mile Desert in South Australia. 1. Preliminary investigations on the Laffer Sand, near Keith.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 4, pp. 336-348, 5 pl., 1945.

In an investigation into the mineral requirements of plants grown on the poor soils of the Ninety-mile Desert, South Australia, cereals and pasture species grown on a reclaimed area of Laffer sand eight miles south-west of Keith without additional phosphate remained very dwarfed and developed conspicuous symptoms of phosphorus deficiency. The addition of superphosphate allowed vigorous growth, 2 cwt. per acre giving maximum yields. The yield of Algerian oats was greatly increased by a zinc sulphate dressing, lucerne responded to copper sulphate, and the yield and seed production of subterranean clover [*Trifolium subterraneum*] were improved by the addition of zinc sulphate and copper sulphate together. Oats grown with liberal applications of superphosphate alone continued to show

phosphorus deficiency discoloration; zinc sulphate reduced this symptom, but more so at low than at high phosphate levels. The symptoms were not improved by nitrogen, potassium, or copper.

HOPKINS (D. P.). **Chemicals, humus, and the soil.**—278 pp., 5 pl., London, Faber & Faber Ltd., 1945. 12*s*. 6*d*.

In Chapter XIII (pp. 200–219) of this manual, described as 'a simple presentation of contemporary knowledge and opinions about fertilizers, manures, and soil fertility', the author sums up and discusses the arguments for and against the theory that the application of chemical fertilizers impairs the resistance of plants to insect pests, fungal pathogens, and viruses and gradually leads to epidemic ill health [cf. *R.A.M.*, xxv, p. 231]. He concludes that there is no evidence that the incidence of such troubles is increased by the use of chemical nutrients; on the contrary, the treatment in question appears to enhance resistance to some diseases.

É falsa a notícia do aparecimento do 'carvão' nos Canaviais de São Paulo. [The notice of the appearance of 'smut' in the Cane fields of São Paulo is erroneous.] —*Biológico*, xii, 3, pp. 71–72, 1946.

A recent notice in one of the São Paulo daily papers regarding the alleged appearance in the sugar-cane plantations of the State of the dreaded smut (*Ustilago sacchari*) [*U. scitaminea*] was found to rest on confusion between the symptoms of that disease and the presence of a sooty mould.

ARRUDA (S. C.). **As doenças da Cana de Açúcar no Estado de São Paulo. III. Doenças de importância secundária.** [Sugar-Cane diseases in the State of São Paulo. III. Diseases of secondary importance.]—*Biológico*, xii, 3, pp. 63–69, 2 pl., 1946.

Sugar-cane diseases of minor importance in São Paulo, Brazil [cf. *R.A.M.*, xxv, p. 279], include 'iliau' (*Gnomonia iliau*) [*R.A.M.*, ix, p. 807], red rot (*Physalospora tucumanensis*), pineapple rot (*Ceratostomella paradoxa*), and leaf sheath rot (*Cytospora sacchari*), involving the stems and leaf sheaths; the foliicolous brown spot (*Cercospora longipes*), ring spot (*Leptosphaeria sacchari*), brown stripe (*Helminthosporium stenospilum*) [*Cochliobolus stenospilus*], red stripe (*Phytomonas* [*Xanthomonas*] *rubrilineans*), and 'pokkah boeng' (*Fusarium moniliforme*) [*Gibberella fujikuroi*]; and the root-rot complex, associated with *Pythium arrhenomanes*, *Marasmius sacchari*, *Himantia stellifera*, and *Rhizoctonia* [*Corticium*] *solani*.

LANGERON (M.). **Précis de mycologie.** [A compendium of mycology.]—674 pp., 393 figs., Paris, Masson et Cie, 1945. Fr. 450.

The kingdom of living fungi is presented as a background for the student of mycology in general, and of medical mycology in particular. The scene is dominated by the major fact of the extreme polymorphism displayed by all fungi, of which a special manifestation is the morphological reduction suffered by fungi while *in statu parasitico*; and added to this are the unique features of the diplophase and of tetrapolar sexuality displayed by certain fungi. Two laws enunciated by the author concern, firstly, the convergence of morphological characters shown by fungi of diverse affinities, but which live in similar habitats; and, secondly, the mutual reaction of the substratum on the fungus, and conversely of the fungus on its substratum. Five classes of fungi are admitted: Archimycetes, Phycomycetes, Ascomycetes, Basidiomycetes, and Adelomycetes or Fungi Imperfecti.

The chapter on the thallus introduces the student to true mycelium, pseudomycelium, granulomata, sclerotia, bulbils, the propagads of *Omphalia flavida*, with the

aggregation of mycelium both subterranean and aerial into both vegetative and conidial synnemata; and also into sexual stromata and asexual ones, viz., sporodochia, acervuli, pionnotes, and the various types of pycnidia. Next come the organs of fixation; stolons and appressoria, haustoria, the hyphopodia of ectoparasites, and the prehensile organs of the nematode fungi.

The chapter on spores first reviews the sexual types, oospores, zygospores, ascospores, and basidiospores (20 pp.) and then the asexual spores (60 pp.). In the latter the author follows Vuillemin's original classification into thallospores, which are non-caducous and formed from pre-existing portions of the thallus, and conidia, which are caducous and arise *de novo*. Under the former are included arthrospores, blastospores, dictyospores, chlamydospores, and aleuriospores: under the latter conidia on undifferentiated conidiophores (Sporotrichées), those on differentiated conidiophores (Sporophorées), and those on special structures, the phialospores. He also accepts further differentiations, such as myxospores (slime spores) and xerospores (dry spores), macroconidia and microconidia, and a number of special types. A longer chapter deals with liberation of all these different spores from their supports, and with their dispersal after liberation; all groups from the Phycomycetes to the Adelomycetes are considered in detail.

Other chapters deal, respectively, with the flow of the cytoplasm, with hyphal fusions, with the fungi of significance in medical mycology, and with sexuality in the fungi. There is a full chapter on laboratory technique for the examination of living material, and of fixed and stained material, and for making and maintaining pure cultures.

The book closes with a brief account of the classification which the author himself finds most helpful. For this purpose he is proposing no new orders, families, genera, or species, and only a single terminological neologism, simblospore to replace zoospore. He thinks that current science is better served in suppressing one old genus or one old species than in proposing a hundred new ones.

TRINCHIERI (G.). **Notes for the history of mycology. A copy of the Sylloge Fungorum with corrections, additions, annotations and other details appended by the author.**—*Int. Bull. Pl. Prot.*, xix, 7–8, pp. 49M–72M, 1945.

Selections are given from a large number of important notes in Saccardo's handwriting made in the first twenty-two volumes of the Sylloge and the Addimenta ad volumina I–IV which were purchased in 1925 in the original issue (Padua, 1882–1913) for the library of the International Institute of Agriculture, Rome.

CUNNINGHAM (G. H.). **Additions to the smut fungi of New Zealand, I.**—*Trans. roy. Soc. N.Z.*, lxxv, 3, pp. 334–339, 1945.

Ten additional species of smuts (one new) have been collected in New Zealand since the publication of the author's previous paper on this group [*Trans. N.Z. Inst.*, lxi, pp. 402–418, 1930], bringing the total for the Dominion to 40, together with four new hosts [see next abstracts]. Among the important additions not already noted from other sources may be mentioned *Sphacelotheca cordobensis* on *Panicum miliaceum*; *Sorosporium reilianum* [*Sphacelotheca reiliana*] on maize, the first record of any smut on maize in the Dominion; and *Urocystis agropyri* on *Festuca arundinacea*, probably the same as flag smut (*U. tritici*) of wheat.

CUNNINGHAM (G. H.). **Keys to genera and species of New Zealand smut fungi.**—*Trans. roy. Soc. N.Z.*, lxxv, 3, pp. 340–346, 1945.

Keys are supplied to the nine genera and 40 species of smuts so far recorded from New Zealand [see preceding and next abstracts], together with an alphabetical list of hosts.

Cunningham (G. H.). **A revision of the New Zealand species of Farysia.**—*Trans. roy. Soc. N.Z.*, lxxv, 3, pp. 328–333, 1 fig., 1945.

Revised diagnoses are given of five species of *Farysia* occurring in New Zealand (four on *Carex* and one on *Gahnia* spp.), together with a key [see preceding abstracts].

Cunningham (G. H.). **Additions to the rust fungi of New Zealand, I.**—*Trans. roy. Soc. N.Z.*, lxxv, 3, pp. 324–327, 1945.

Four additional species of rusts (including a new one) collected since the publication of 'The rust fungi of New Zealand' (1931) [*R.A.M.*, xi, p. 263] bring the total for the Dominion to 150. They include *Puccinia rhei-undulati* [ibid., xiv, p. 719] on rhubarb, which is spreading slowly through the Dominion. Eight additional hosts are also listed.

Christensen (C. M.). **Keys to the common fleshy fungi.**—45 pp., 8 pl., 69 figs., Minneapolis, Burgess Publishing Company, 1946. $1.50. [Mimeoprinted.]

These illustrated keys to nearly 250 species of common gilled fungi and over 100 species of other fleshy fungi are intended for beginners and designed primarily for self-teaching students. Technical terms are avoided as much as possible, and most of the characters used to determine the larger groups and genera are illustrated by plain explanatory diagrams. No microscopic features are described. Preliminary versions of the keys have already been in use for ten years, and have proved satisfactory for the common larger fungi found in the eastern half of the United States and southern Canada.

Greene (H. C.). **Notes on Wisconsin parasitic fungi. V & VI.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxvi, pp. 225–268, 1944. [Received May, 1946.]

The following records occur in these two further instalments of the author's annotated list of Wisconsin parasitic fungi [*R.A.M.*, xxiv, p. 340; cf. also ibid., xxii, p. 374]: *Coniothyrium insitivum* Sacc. on barberry, *Ramularia multiplex* Peck on *Vaccinium macrocarpon*, *Cladosporium* sp. on the aecidial cups of *Tranzschelia* [*Puccinia*] *pruni-spinosae*, *Phoma moricola* Sacc. on mulberry (*Morus rubra*), *Septoria pentstemonis* Ell. & Ev. on *Pentstemon digitalis*, *Melasmia hypophylla* (B. & Rav.) Sacc. on *Gleditschia triacanthos*, *Cryptosporella anomala* on *Corylus americana* [ibid., xiii, p. 208], *Cercospora sequoiae* var. *juniperi* Ell. & Ev. on *Juniperus communis* var. *depressa*, *Helminthosporium sativum* on *Agropyron repens*, and *C. cannabis* (Hara) Chupp n. comb. (*Cercosporina cannabis* Hara) on hemp.

Bitancourt (A. A.). **Novas espécies sul-americanas do género Elsinöe.** [New South American species of the genus *Elsinoe.*]—*Arq. Inst. biol., S. Paulo*, xvi, 3, pp. 19–25, 1945. [English summary.]

Of the four species listed, *Elsinoe bertholletiae* n. sp., the agent of a leaf spot of Pará chestnut or Brazil nut (*Bertholletia excelsa*), in Amazonas, Brazil, and believed to be the first recorded on this host, is characterized by globose or oblong asci, 25 to 35 by 18 to 30 μ, occupied by up to eight hyaline ascospores with three to four transverse and one or more longitudinal septa, 14 to 22 by 6 to 9 μ. The paliform, dark-coloured, densely fasciculate conidiophores of the imperfect (*Sphaceloma*) state measure 12 to 20 by 3 to 4 μ, and are sometimes provided with one or two transverse septa. Conidia were not observed. The scattered, rarely confluent lesions produced by the fungus on both leaf surfaces are round, irregular, or angular (when delimited by the secondary veins), and are of two kinds: up to 1 mm. in width, dark, with a narrow, pecan-brown, raised margin, and 1 to 4 mm. in width, with a white centre, the superficial tissue either disintegrated and traversed by

radial fissures or perforated and surrounded by a raised margin. The mesophyll assumes a mineral-red to mars-violet tinge over a radius of 5 mm. round the lesions.

Losa España (D. M.). **Aportaciones a la flora de micromicetos del Pirineo Español.** [Contributions to the Micromycete flora of the Spanish Pyrenees.]—*An. Jard. bot. Madr.*, v, pp. 79–126, 24 figs., 1945.

Included in this annotated list of fungi in the Spanish Pyrenees [cf. *R.A.M.*, xxiv, p. 475], collected in 1943 and 1944 in connexion with the investigation of the local flora by the Station of Pyrenean Studies, are *Polythrincium* [*Cymadothea*] *trifolii* on clover, *Septoria saponariae* on *Saponaria officinalis*, *Uromyces fabae* on *Vicia sepium* [ibid., xv, p. 529], *Puccinia menthae* on *Mentha longifolia* [ibid., xx, p. 495], *Melampsora allii-populina* on aspen (*Populus tremula*) [ibid., xv, p. 529], *Phragmidium rubi-idaei* on raspberry, and *Cronartium flaccidum* [ibid., xxii, p. 53] on *Pedicularis comosa*.

Alcalde (Maria B.). **Datos micologicos.** [Mycological data.]—*An. Jard. bot. Madr.*, v, pp. 143–160, 9 figs., 1945.

Eight of the 72 species of fungi from various parts of Spain comprised in this annotated list are new to science, while others have not hitherto been recognized among the mycoflora of the country or are of geographical interest. Mention may be made of *Pleospora media* f. *hortensiae* n. f. on *Hydrangea hortensis*, *Sphaerella verrucosa* n. sp. on ivy (*Hedera helix*), and *Pyrenochaeta helicina* n. sp. on the same host (both on living leaves).

Snyder (W. C.) & Hansen (H. N.). **The species concept in Fusarium with reference to Discolor and other sections.**—*Amer. J. Bot.*, xxxii, 10, pp. 657–666, 1945.

Continuing their revision of species of *Fusarium* [*R.A.M.*, xxi, p. 223] the writers consider that all species, varieties, and forms of the sections *Roseum* [ibid., xxiii, p. 410], *Arthrosporiella*, *Gibbosum*, and *Discolor* should be reduced to one species, *F. roseum* Link, with one form, f. *cerealis* (Cooke) n. comb. for the strains parasitic on cereals. For the perfect state they propose *Gibberella* '*roseum*' (Link) n. comb. with the synonym (among others) *G. zeae* (Schw.) Petch, and the form *G. roseum* f. *cerealis* (Cooke) n. comb. The reasons given are that the morphological features which have been used in the classification of these sections, viz., the production and position of chlamydospores, the production and colour of sclerotia, the formation of sporodochia, the colour of the mycelium and the stromata, have been shown by these and other authors as too variable and undependable to be used as distinguishing features. Similarly, conidial shape, colour and septation, foot-cell development and wall thickness are often inconstant and are considered too difficult or unsuitable as criteria. Culture mutation causes further difficulties. On the other hand, some of the species, although not the usual pathogens of cereals, can be made to show pathogenicity in tests, the symptoms then produced being very similar, and moreover, they are often closely associated with root rots. All members of the section *Lateritium* are reduced to *F. lateritium* Nees emend., with the perfect state *G.* '*lateritium*' (Nees.) n. comb. Similarly, the members of other sections are reduced, the conidial features on which the classification has been based having been shown to be unsatisfactory. All members of the section *Liseola* are referred to *F. moniliforme* Sheld. emend., with the perfect state, *G. moniliformis* (Sheld.) Winel. emend. The form species of the section *Sporotrichiella* is *F. tricinctum*, the pathogen on carnations being *F. tricinctum* f. *poae* (Pk) n. comb. The variation of *F. nivale* has been found wide enough to include all the species of the section *Arachnites* with the perfect state as *Calonectria* '*nivale*', the cereal pathogens being *F. nivale* f. *graminicola* (Berk. & Br.) n. comb. *F. episphaeria* (Tode) n. comb. with the Ascomycetous

species *Nectria episphaeria* and one physiologic form f. *coccophila* (Desm.) n. comb. embraces all the types in the sections *Eupionnotes* and *Macroconia*. Although the members of the sections *Submicrocera* and *Pseudomicrocera* were not studied, on the basis of descriptions they are merged into *F. ciliatum* with the one perfect stage *Calonectria* '*ciliatum*' n. comb., both listed as doubtful species. The one species *F. argillaceum* in the section *Ventricosum* is regarded as synonymous with *F. solani*.

The writers admit that physiologic host specialization has not been tested or proved for many *Fusarium* pathogens. When it has, additional formae will have to be established.

Sansome (E. R.). **Maintenance of heterozygosity in a homothallic species of the Neurospora tetrasperma type.**—*Nature, Lond.*, clvii, 3989, pp. 484–485, 2 figs., 1946.

The author demonstrates diagrammatically how in *Neurospora tetrasperma* the inclusion in one ascospore of two nuclei of different types maintains the heterozygosity of characters other than those producing bisexuality. Absence of crossing-over will lead to the segregation of these factors in the first division, resulting in spores which are all alike in one ascus, whereas crossing-over will give segregation in the second division and spores of two types in one ascus. Therefore by culturing spores it is possible to determine where segregation has occurred. The results of Dodge, Schmitt, and Appel are used to illustrate this.

Norris (D. O.). **Differential isolation of Chaetomium spp. from mixed populations by hypochlorite solution.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 4, pp. 310–313, 2 pl., 1945.

The author's studies showed that *Chaetomium* spores are highly resistant to calcium hypochlorite solution prepared by J. K. Wilson's method and containing about 2 per cent. chlorine. Large numbers of spores of *C. globosum* survived immersion for 15 minutes, while an occasional spore survived for two hours. As this solution is a very effective sterilizing agent against other fungi and bacteria, its use in culture plates enables *C.* spp. to be isolated at will from mixed populations.

Zuck (R. K.). **Isolates intermediate between Stachybotrys and Memnoniella.**—*Mycologia*, xxxviii, 1, pp. 69–76, 2 figs., 1946.

The author considers *Stachybotrys* and *Memnoniella* [*R.A.M.*, xxiv, p. 389] to be valid genera, though he found isolates intermediate between the two, having both slimy heads and chains of spores. Other cultures of *M. echinata* remained stable with catenulate spores, including one which was at first misidentified as *S. papyrogena*. No culture of *S. subsimplex* was obtained from cloth exposed to soil contacts unless this designation may be applied to the intermediate phase found.

Agatov (P.). Влияние иода на активность вируса табачной мозаики. [The influence of iodine on the activity of the Tobacco mosaic virus.]—*C. R. Acad. Sci. U.R.S.S.*, N.S., xlix, 7, pp. 542–544, 1945.

Experimental evidence is adduced to show that inactivation of the tobacco-mosaic virus protein by iodine is negligible at P_H 5·5 to 6·6, but complete at 4·5 and at 8·0. Inactivation on the alkali side is attributed to the oxidizing effect of the iodine and that on the acid side to assimilation with the protein.

Wei (C. T.) & Cheo (P. C.). **Diseases of Tomato in the vicinity of Chengtu.**—*Chin. J. agric. Sci.*, i, 4, pp. 288–291, 1944. [Chinese, with English summary. Received June, 1946.]

Notes are given on the following diseases, arranged in order of decreasing importance, affecting the tomato crop in the vicinity of Chengtu, China: common

mosaic [tobacco mosaic virus], streak [a strain of the foregoing], fern-leaf [cucumber mosaic virus], spotted wilt virus, bunchy top virus, yellow mosaic [a strain of the tobacco mosaic virus], sour rot (*Oospora lactis parasitica*), anthracnose (*Colletotrichum phomoides, Gloeosporium fructigenum* [*Glomerella fructigena*], and *Vermicularia* [*C.*] *capsici*), leaf spot and stem canker (*Septoria lycopersici*), leaf spots and fruit rots (*Phoma destructiva* and *Ascochyta lycopersici*), bottom rot, fruit rot (*Alternaria tenuis*), early blight (*A. solani*), fruit rot (*Discosporella phaeochlorina* Wei and Cheo), soft rot (*Erwinia carotovora*), soil rot (*Rhizoctonia* [*Corticium solani*), sun scald, *Fusarium* fruit rot, cottony leak (*Pythium aphanidermatum*), fruit rot (*Phytophthora parasitica*), sclerotial disease (*Sclerotium rolfsii*), dry rot (*Phomopsis* [*vexans*]), and fruit rot (*Nematospora lycopersici*).

The tomato strain of *G. fructigena* was shown by cross-inoculation experiments to be identical with the agent of apple and pear bitter rot, while the same form of *Colletotrichum capsici* is responsible for the infection of tomato, eggplant, and [chilli] pepper.

Control measures are indicated.

Miller (H. W.). **A new disease of Russian olive in the Pacific Northwest.**—*J. For.*, xliv, 2, pp. 118–120, 1946.

Russian olive (*Elaeagnus angustifolia*), widely grown for soil and water conservation purposes in the Pacific Northwest, has been attacked by a hitherto-unreported disease of obscure etiology. The first and most typical feature is the arrested development of the buds, which remain in a partially opened condition and gradually desiccate. The following year the affected portion of the branch is dead, and the same symptom occurs progressively down the stem until the root collar is reached and the tree killed. Small, brown, necrotic areas are formed just outside the phloem, usually on the under side of diseased stems. In a typical planting in Washington of 194 trees, laid down in 1938, only one was still surviving in 1943, and that was severely diseased.

McKinney (H. H.). **Soil factors in relation to incidence and symptom-expression of virus diseases.**—*Soil Sci.*, lxi, 1, pp. 93–100, 1946.

A comprehensive survey is made of the principal literature covering disease incidence in the wheat mosaic rosette and yellow mosaic (*Marmor tritici*) [*R.A.M.*, iii, p. 84; vii, p. 232; xxiv, p. 136], tobacco mosaic (*M. tabaci*) [ibid., ix, p. 207; xiii, p. 729], tomato mosaic and tomato streak [ibid., vii, p. 481], and big vein of lettuce [ibid., xiv, p. 283; xxi, p. 512; xxiii, p. 259; xxiv, p. 135] virus diseases with special reference to their overseasoning in the soil and to the influence of soil factors on the activity of viruses in the plant and on plant reactions. The tobacco and tomato mosaic viruses appear to reinfect from plant debris and are eliminated by the removal or ploughing-in of this or by alternate cropping; the wheat mosaics and lettuce viruses are eliminated only by soil sterilization.

Among the various aspects discussed are the confusion in diagnosis of symptoms arising from disturbances of the chlorophyll status plants due to mineral deficiencies; the tendency for high nitrogen status of the soil to favour mosaic infection, but to obscure the symptoms causing yellow mosaics to resemble light green mosaics and almost to obliterate the latter; the use of nitrogen fertilizers as a means of confirming the view that succulent plants are more susceptible to viruses; and the effect of fertilizers on the incidence and severity of virus diseases, in particular the effect of nitrogen applications from minimum to maximum on tobacco mosaics is reviewed in relation to (1) number of lesions and incubation time, with and without the additions of either or both phosphorus or potash, (2) protein synthesis and virus content, and (3) inoculations of young and old leaves and subsequent spread of the virus are among the soil factors reviewed.